INDIAN MEDICINAL PLANTS



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By

Lt.-Colonel **K. R. KIRTIKAR,** F.L.S., I.M.S. (*Retired*),

Major **B. D. BASU,** M.R.C.S. (Eng.), I.M.S. (*Retired*),

AND

An I. C. S. (*Retired*).

2046.

Second Edition

IN FOUR VOLUMES

EDITED, REVISED, ENLARGED, AND MOSTLY REWRITTEN BY

E. BLATTER, S.J., Ph.D., F.L.S.,

J. F. CAIUS, S.J., F.L.S., M.S.C.I. (*Paris*),

AND

K. S. MHASKAR, M.D., M.A., B.Sc., D.P.H., D.T.M. & H.

VOLUME I

PUBLISHED BY

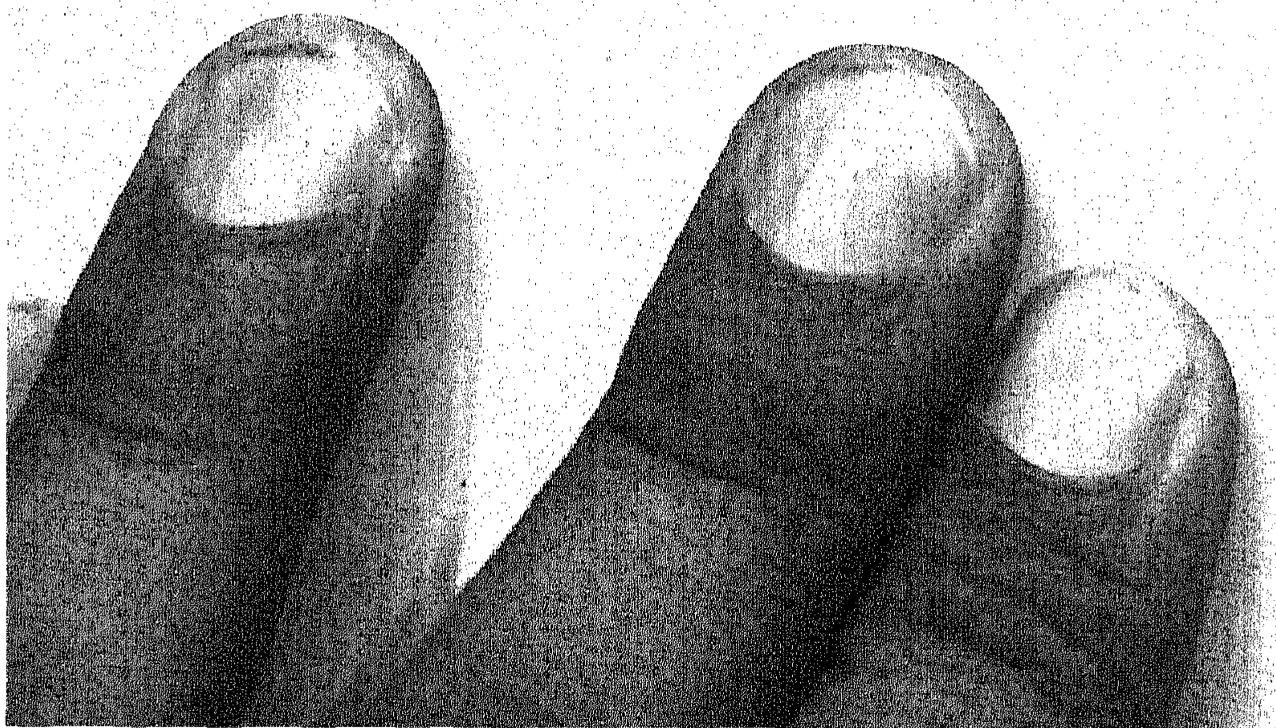
LALIT MOHAN BASU, M.B.

49, Leader Road, Allahabad, India.

DEDICATED

TO THE

MEDICAL PROFESSION OF INDIA



PREFACE TO THE SECOND EDITION

This work was undertaken at the request of the late Major B. D. Basu who, at first, intended it to be an enlarged edition of his book on Indian Medicinal Plants, published in collaboration with Lieut.-Col. K. R. Kirtikar. When, however, some of the imperfections of the original had been brought to his knowledge he readily admitted that the book would gain by being rewritten, and he sent us whatever additional material he had collected to be dealt with as we thought best. The additions, which mostly consisted of plants used medicinally in Lakhimpur, Assam, have been duly incorporated in our text.

This work is more than a revision of Kirtikar and Basu's " Indian Medicinal Plants ". While reminiscent of the old text, the material has been almost completely rewritten and considerably increased. The area dealt with comprises British India, including Burma and the Malay Peninsula, Ceylon, and Baluchistan.

As to the botanical part we have tried to bring the work up-to-date with regard to systematic changes and nomenclature. As to the descriptions of families, genera, and species we have not made the slightest attempt at being original. This would have entailed an enormous amount of useless toil. Wherever we have found a good description of a plant we have copied it verbatim; and we have thus to thank all the authors of general and local floras of India, or parts of India. For want of reliable information fungi and lichens have not been described botanically, and algae have been altogether left out of consideration.

Reference to Roxburgh's Botany being now uncalled for has been suppressed. Reference to the Plates has been carefully revised so as to agree with the new synonymy. No new Plates have been added; but their absence is, in our opinion, largely compensated for by the introduction of keys to genera and to species.

Initial capital letters, commonly used with specific names, have

been discarded. In the great majority of cases, we have, however, retained them in the synonymy and also in the "official" notes which, spelling mistakes not excepted, have been copied from the respective pharmacopœias. The perusal of these notes will, we hope, convince research workers in India of the importance of quoting the authority when mentioning a botanical name. Botanical synonymy has reached such a state of hopeless confusion that no name has a full scientific value without mention of the authority. It is a melancholy fact to note that, little as it is, much of the analytical work on Indian plants is vitiated by carelessness about identification.

The value of the scientific names is that they are international, and enable one to initiate and continue investigations on any particular plant in any part of the world. Many plants are consmopolitan by nature, others have been introduced from one country into another and have been thriving ever since in their land of adoption. Among the alterations made in the present work we must mention the inclusion of a great number of plants which grow in India and which we know are used medicinally in some other country or countries. Such plants are no doubt, Indian and medicinal. On the other hand we have carefully avoided the inclusion of imported drugs commonly sold in Indian bazaars and widely used medicinally throughout the length and breadth of India. Such plants are, no doubt, medicinal, but they are not Indian.

Herbalism has been one of the main branches of medicine for centuries in all parts of the world, and the science of therapeutics as we know it, is comparatively recent. And, since it is the fashion to ascribe to Europe every advance in the scientific field, let us casually note that in Europe some of our grandmothers' herbal remedies are still effective, that in some cases they are as good as those of modern medicine, and that many modern European medicines are modifications or survivals of ancient herbalism. To prove that phytotherapy is not restricted to one particular backward people we have recorded the names of plants still officially retained in the various pharmacopœias, and have given under the generic term the names of the species used medicinally in parts of the globe other than India. This latter enumeration is forcibly restricted to the

source of information at our disposal, though amply sufficient for our purpose.

Our work is primarily concerned with the therapeutic properties of Indian medicinal plants, and consequently we have assigned the pride of place to Ayurveda and Yunani. Modern uses in India come next, and these are followed by uses in other countries. Finally we record the findings obtained by research workers who have been engaged upon the study of indigenous drugs.

Fully aware, as we are, of the numerous pitfalls in the path of research and fully cognizant of the actual limitations in the fields of chemistry and pharmacology, we have deliberately abstained from indulging in any criticism of the results.

This work further represents an attempt to relate the vernacular to the scientific names. There is no doubt that vernacular names may help a great deal towards identification; but, as it is unfortunately too often the case, to rely solely on the vernacular name for the purpose of identification is unscientific, and such a procedure on the part of a research worker cannot be too strongly condemned. However, let alone the research worker, every one values the local names of plants, even if such names do cause confusion at times. So we need not apologise for lists which may in some cases appear uncommonly long.

Our hearty thanks are due to Dr. L. M. Basu who, after his father's death, so readily and generously shouldered the heavy burden of seeing this work through the press.

PANCHGANI,
September 1, 1933.

E. BLATTER.
J. F. CAIUS.
K. S. MHASKAR.



PREFACE TO THE FIRST EDITION

BEFORE the completion of Sir Joseph Hooker's great book 'Flora of British India,' the only comprehensive work on Indian Botany was that of Dr. W. Roxburgh. But it was long out of print and the Rev. Dr. Carey's edition of that important work sold in London for something like £5. The late Mr. C. B. Clarke of the Educational Department of Bengal, afterwards Inspector of Schools in Assam, conferred a great boon on students of Indian Botany by bringing out a reprint of that work in 1874 and pricing it so low as 5 rupees only. Unfortunately, it is now out of print. When more than 25 years ago, I commenced the study of Indian Medicinal Plants, I had to work with this well known book. So the reference to Roxburgh throughout the present work is to the pages of that reprint.

I also experienced great difficulty in identifying the plants for not possessing illustrations of most of them. It is almost impossible for a person of moderate resources to provide himself with all the illustrated works on Indian Botany, especially as a good many of them, having become out of print, are procurable only at fabulous prices. I found that for a proper study of the subject there was a great want of a work containing illustrations, botanical descriptions, vernacular names and uses of the medicinal plants of this country. It was to supply this want to some extent that the present work was undertaken. In this undertaking I was very fortunate to have secured the co-operation of the late lamented Lieutenant-Colonel Kanhoba Ranchoddas Kirtikar, F.L.S., I.M.S., a botanist of great repute, who possessed a very rich library of Botany and other sciences allied to it. Himself a good draughtsman, he had also employed an able artist of Bombay to draw and paint from nature, plants of economic importance. The faithfulness of these drawings is admired by those who have seen them. Colonel Kirtikar very readily allowed me to publish them with this work. He also kindly undertook to prepare the botanical descriptions of the plants, and was helped in this portion of his task by an able member of the Indian Civil Service, who to

his other accomplishments adds a great taste for Botany. His notes have been incorporated by Colonel Kirtikar in the botanical descriptions.

Before his lamented death, which took place on May 9, 1917, Colonel Kirtikar had left in manuscript the botanical descriptions of almost all the plants mentioned in this work. It is to be greatly regretted that he did not live to give a finishing touch to his writings. He was, however, able to revise the proofs of about the first 500 pages of this book.

When we undertook the preparation of this work, it was decided that it would not be a treatise on Materia Medica. A work of that nature should include—

"(1) Characters and means of recognition of the crude drug including—

(*a*) External appearance, feel, [taste], smell, weight, &c.
(*b*) Microscopical characters and tests.
(*c*) General adulterants and mode of detection.

(2) To know whence and how the drug is obtained.

(3) The general properties of the crude drug, and the source of its special properties, *i.e.*, its active principle, treated generally.

(4) To know the method of development of the drug itself, so far as practicable; and the nature, anatomical and developmental, of the structures whence it is obtained.

(5) The preparations in which the drug forms a part, the processes of preparation and their *rationale;* methods of manipulation, etc.

(6) The doses of the drug and of its preparations.

(7) The physiological action of the drug and its preparations."

Pharmacographia Indica by Messrs. Dymock, Warden and Hooper still remains an authoritative work on Indian Materia Medica. The present work is a Botany of Indian Medicinal Plants and so no account of drugs procurable in Indian bazaars is given in it.

It is true that most of the illustrations in this publication are reproductions from those in various works on Indian Botany and other standard works on the subject. This, we submit, should not

be considered in any way to lessen the importance of the work. It has been truly observed by an eminent writer:—

"Exaggerated individual energy and independence have become conceit . . . .

"The chief business with him (a young man) is not to work well, but to work in a different mode to others; originality is more to him than beauty. This idea which now-a-days has such a strong hold on all heads, even the most empty, reminds us of that graceful epigram of Goethe's on originals. A certain person says, 'I do not belong to any School, there exists no living master from whom I would take lessons, and as to the dead, I have never learnt any thing from them,' which, if I am not mistaken, means, 'I am a fool on my own account.' What else is this extravagant desire for originality, but, as we have said, an exaggeration of individual energy, a want of equilibrium, the sin, in fact, of pride?" *

Dr. Garnett writes:—

"The truly artistic production, * * * may well outlast the inferior work * * as the diamond survives the glass which it engraves." †

The illustrated works on Indian Botany of such well-known masters of the subject, as Rheede, Roxburgh, Royle, Burman, Brandis, Beddome, Griffith, Wallich, Wight and several others, are not easily accessible to those who are interested in the study of the subject. It is, therefore, that their illustrations have been copied and supplemented, where necessary, by further details.

I was in charge of the Indigenous Drugs Court of the United Provinces Exhibition held at Allahabad in December, 1910 and January and February, 1911. One of the special features of the Indigenous Drugs Court was the exhibition of herbarium specimens and of drawings of almost all the known plants used in medicine in this country. I collected drawings from the illustrated works on Indian Botany and other standard works on that subject available in the United Provinces. The late Dr. E. G. Hill lent to the exhibition the illustrated works on Botany from the Allahabad Public Library of which he was the Secretary. The President and the Imperial Forest Botanist of the Forest Research Institute of Dehra Dun were kind enough to lend illustrated books on Botany which were not to be had at Allahabad. The late Lieutenant-Colonel Kirtikar, F.L.S., I.M.S. (Retd.), very kindly lent the paintings already referred to above to the exhibition.

But still I was unable to secure illustrations of about 300 Indian Medicinal Plants for the Exhibition. I wrote to the Superintendent,

* "The Decadence of Modern Literature by Armando Palacio Valdes of Madrid in the International Library of Famous Literature, Vol. XX.

† "The use and value of Anthologies," in the International Library of Famous Literature, Vol. I.

Royal Botanical Garden, Sibpur, Calcutta, if he would kindly lend the drawings of those plants from the Herbarium in his charge. In his letter dated 24th May, 1910, he wrote:—

"I regret that I cannot see my way to let you have a loan of the original drawings of any plants, as it is a strict rule in all botanical institutions that original drawings are not allowed to go out of the building for any purpose, as in the event of loss or damage they could not possibly be replaced. I should however be quite prepared to have exact copies made of such drawings as may be of interest to you at the expense of the Exhibition. For large full size drawings coloured, the rate for copying including paper would be Rs. 5-8-0 each."

About this time, I made the acquaintance of Professor Bhim Chandra Chatterji, B.A., B.SC., then of the Bengal Technical Institute, Calcutta. I was told that he had collected materials and illustrations of plants of Hindu Materia Medica, as he was preparing a work on that subject. So I wrote to him to exhibit his collection at the Exhibition. He came to Allahabad to see me. On showing him the letter of the Superintendent, Sibpur Garden, he said he would take photos of those plants and their drawings which would cost less than one-fifth of the estimate given in the letter referred to above.

I went to Calcutta and taking Professor Bhim Chandra Chatterji introduced him to the Superientendent, who very kindly afforded him every facility to take photos of plants and of their drawings. But, unfortunately, Professor Bhim Chandra Chatterji was not successful with his photographs. He then arranged with the Sibpur artists to copy the drawings of plants preserved in the Herbarium there at very favourable terms.

The late lamented Mr. G. R. Murray, I.C.S., who was Secretary of the United Provinces Exhibition, took great interest in the Indigenous Drugs Court and did all that lay in his power to make it a success. He got his committee to sanction the sum necessary to procure copies of drawings of the plants. After closure of the Exhibition, while he was acting as Registrar of the High Court, Allahabad, he enquired several times about the progress in printing of the present work, more especially of the plates, thus showing his interest in this publication.

Over 300 drawings were copied in about five months. Professor Bhim Chandra Chatterji had little time to compare the copies with the originals and was, therefore, unable to vouch for their accuracy. Details of several drawings, especially those made from type speci-

mens, had to be completed. So in December, 1911 I went down to Calcutta and compared the copies of the drawings with the originals. Owing to pressure of work at Allahabad, I could not prolong my stay in Calcutta. So several plates were left at Sibpur for details to be filled in. Colonel Gage, I.M.S., obliged me by getting this done. In his letter dated 29th March, 1912, in returning the drawings he wrote:—

"I return herewith the drawings you sent for filling in the details of the dissections. They have been gone over by Mr. Ramaswamy and checked in every case. It has not always been possible to get precise dissections from the Herbarium specimens, as in the case where there is one specimen we cannot afford to dissect it. I trust however what has been done will prove to your satisfaction."

He has placed us under deep obligation by permitting us to copy and publish some of the original drawings by Roxburgh preserved in the Herbarium in the Royal Botanical Garden, Sibpur, and to reproduce some of the illustrations given in the Annals of it, and also to have drawings made from the type specimens in the Herbarium, of some of the plants not to be found in publications kept in the library of that institution.

Our thanks are due to Mr. R. S. Hole, F.C.H., F.L.S., I.F.S., Forest Botanist of Dehra Dun, for his kind permission to copy and publish some of the original drawings of plants prepared by Mr. J. F. Duthie, B.A., F.L.S., late Director of Botanic Survey, Northern India.

We are thankful to the publishers of Curtis's Botanical Magazine and of Bentley and Trimen's Medicinal Plants for permission to copy some of the illustrations from their publications; as also to the Government of the United Provinces of Agra and Oudh for allowing us to copy a few illustrations from the Field and Garden Crops of the North-Western Provinces prepared by Mr. Duthie and Mr. [now Sir] Bampfylde, Fuller.

The Government of India, the Mussoori Botanical Garden, the Agricultural Bureau and the Smithsonian Institution of America, as well as the Board of Agriculture of England, have greatly helped us in the preparation of this work by their supplying us with some of their publications bearing on the subject.

Some of those works on Botany which were not in the library

of the late Colonel Kirtikar were very kindly lent to us by Colonel Gage from the Library of the Royal Botanic Garden, Sibpur; by the late Mr. Harinath De, M.A., I.E.S., from the Imperial Library, Calcutta, of which he was the librarian; and by Mr. Hole from the Library of the Imperial Forest Research Institute, Dehra Dun. To all these gentlemen, our best thanks are due.

Colonel Gage also very kindly gave instructions to the members of the staff serving under him to assist us in every way in their power in the preparation of this work. The late Mr. M. S. Ramaswami, M.A., and Babu Sashi Bhushan Banerji were of great help to us.

Professor Bhim Chandra Chatterji, was advertised as one of the joint authors of this work. But his portion of the work not being ready, it is regretted it has not been published with this.

My best thanks are due to Babu Chintamani Ghose, the enterprising proprietor of the well-known Indian Press, who has taken great interest in and trouble for this work. He deputed his talented artist, Mr. Sommer, to Europe to fetch large-sized lithographic stones and art-paper for its printing. Without his help and supervision, it would have been impossible to bring out the work in its present get-up, which has exceeded my expectations.

The enlightened Maharaja Bahadur of Cossimbazar, the Hon'ble Sir Manindra Chandra Nandy, K.C.I.E., with his accustomed munificence, has contributed ten thousand rupees to meet a portion of the expenses incurred in the production of this work. Our heartiest thanks are due to him for this handsome donation.

ALLAHABAD,
January 1, 1918.

B. D. BASU.

PUBLISHER'S PREFACE

The first edition of this work on Indian Medicinal Plants, which was brought out on the first day of January, 1918, was printed during the hard times of the last world war, 1914-1918, when it was far more difficult than even now to obtain printing materials of all descriptions at any reasonable price.

The illustrations to this work, which have been printed separately, and the majority of the drugs mentioned in it were exhibited in actual specimens in the great United Province's Exhibition of 1910-1911 organised by the Government, in which my revered father, Major B. D. Basu, was in charge of the indigenous drugs department. It was during this time that he was able to finish the compilation of this work and to finally arrange it for the press, which started the printing early in 1914.

The work, when published, was patronized by the Government and many of the Indian States for the libraries and institutions under their control. It has helped scientists and scientific drug manufacturing chemists in India.

Exactly 17 years after the publication of the first edition, a second edition was called for. Ever since the first edition was out, Major Basu had all along been collecting new materials for the second edition and adding these to his MSS. to make it up-to-date. Unhappily owing to failing eyesight he could not carry on this laborious work himself, and so was on the look-out for a competent reviser. Fortunately he was brought into touch with the renowned Botanist, the late lamented Rev. Father Ethelbert Blatter, S. J., whose name occurs in all serious works on Indian Botany, by Professor Dr. Sahay Ram Bose of the Carmichael Medical College, Belgachia, Calcutta. Through Rev. Father Blatter, Rev. Father J. F. Caius, S. J. of Bombay was introduced to him. Both readily agreed to undertake the work as a labour of love, and they were entrusted by Major Basu with his MSS. and many necessary and important books of reference in February, 1930, when the revisers started their work. Rev. Father

Blatter went through the descriptive portion of the Botanical side of the work and Rev. Father Caius attended to the pharmacological portion and the portion on vernacular synonyms. The association of Dr. K. S. Mhaskar, M.A., M.D., etc., in the revision of the work was not known to my father. I too came to know of it only when the MSS. reached me. His researches along with those of Father Caius in connection with medicinal plants said to have beneficial effects in snake and scorpion bites are worthy of note. These were carried out in the Haffkiene Institute of Bombay. Father Blatter, just after taking over charge of the revision work, went to Waziristan in connection with the completion of his reaserch work in Botany, and Father Caius was called to preside over the Drug Enquiry Committee instituted by the Government of India. A few months thus elapsed after which they were free to take up their respective shares of the work. Unfortunately, as soon as the revisers were able to begin the work, death carried away my father, which melancholy event took place on the 23rd September, 1930.

The revisers have done their work thoroughly and have spared no pains even at the cost of their health to make the work up-to-date. Their manuscripts, which were type-written, in which they were helped by their typist Mr. J. Francis, were very neat and systematically arranged. Their final additions and corrections, which they made during their final revision of the manuscripts, were made in hand-writing at places; but that too was so neat and so carefully placed that these involved no difficulty in proof-reading and printing.

Sometimes 'thanks' are but a poor expression of the deep debt of gratitude which one feels in one's heart when one is helped out of a difficulty, but since there is no other word which can better express one's feelings of gratitude than this I must have recourse to it and express my deep debt of gratitude to the revisers of this work and thank them heartily for all that they have done to complete the work, so well, and all as a pure labour of love.

The revisers sent the manuscripts to me in September, 1933. A few months after that, in June, 1934, Rev. Father E. Blatter left this world and so it is a matter of great regret that he could not actually see the work published. It has also to be recorded with regret that

both the gentlemen with whose collaboration my father prepared the first edition for the press died some years ago.

My heartfelt thanks are due to the Prabasi Press of Calcutta.

Some of the defects which may be noticed in the work, for which I hope to be excused, are partly due to my previous inexperience of seeing a publication through the press but mainly to unavoidable circumstances. The revisers' place of residence was in Bombay, the printer's in Calcutta and mine at Allahabad. Personal consultation whenever necessary was not always possible. Consultation had to be carried on through correspondence by post.

Critical readers of the first edition had suggested to us to add an index of vernacular names of the various plants mentioned in the text. We are alive to such a need and we intend, if possible, to furnish our readers with a separate supplementary volume containing such an index.

Allahabad, 15th April, 1935.

L. M. Basu.

INTRODUCTION.

I

Since disease, decay and death have always co-existed with life, the study of diseases and their treatment must also have been contemporaneous with the dawn of the human intellect. The primitive man must have used as therapeutical agents and remedial measures those things which he was able to procure most easily. There is no authentic record of medicines used by the primitive man. But the *Rig Veda* which is the oldest book in the library of man supplies curious information on the subject. From it, we learn that the Indo-Aryans used the *Soma* as a medicinal agent. It is not quite certain what the *Soma* * plant was. This plant has not yet been satisfactorily

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* Dr. Aitchison has lately stated that *Soma* must be the *Ephedra pachyclade*, which in the Harirud valley is said to bear the name of *hum*, *huma*, and *Yahma*. This supposition is confirmed by Dr. Joseph Barumuller, a botanist long resident in Kerman, who identifies the *Soma* plant with some kind of *Ephedra*, probably *Ephedra distachya*, but who remarks that different varieties of *Ephedra* are to be found from Siberia to the Iberian peninsula, so that one must give up the hope of determining the original home of the Aryas by means of the habitat of the *Soma* plant, (Quarterly Review, No. 384, Octr. 1894, p. 455).

The *Soma* plant possessed intoxicating properties and the Vedic Aryans recognised it as a quickener of the intellect. '*Soma*, like the sea, has poured forth songs, and hymns, and thoughts.' * *

'The beverage (*i.e.*, *Soma* juice) is divine; it purifies, it inspires joy, it is a water of life; . . . . it gives health and immortality.'

"We've quaffed the Soma bright,
And are immortal grown;
We've entered into light,
And all the gods have known.
What mortal now can harm,
Or foeman vex us more?
Through thee, beyond alarm,
Immortal god, we soar."

Address to *Soma*.

"Thou *Soma*, fond of praise, the lord of plants, art life to us."
"Be unto us, *Soma* the bestower of wealth, the remover of disease,
Exulting *Soma*! increase with all twining plants."
"I invoke the divine waters, in which our cattle drink:
Ambrosia is in the waters; in the waters are medicinal herbs."

Soma is supposed to preside over medicinal herbs, and therefore the Rishi Medhatithi continues his hymn, as:—

"*Soma* has declared to me, 'all medicaments as well as Agni, the benefactor of the Universe, are in the waters;' the waters contain all healing herbs.

"Waters bring to perfection all disease,—dispelling medicaments for (the good of) my body, that I may long behold the sun.

"Waters take away whatever sin has been (found) in me, whether I have (knowingly) done wrong or have pronounced imprecations (against holy men) or (have spoken) untruth.

identified. The Indo-Aryans used the plant for sacrificial purposes and its juice is described in the ancient Aryan literature as a stimulating beverage. The word ओषधि (oshadhi) literally means heat-producer. When the Indo-Aryans came to use the *Soma* plant for therapeutical purposes, they came to possess a knowledge of the medicinal properties and uses of herbs and plants. Hence, *Oshadhi* (ओषधि) applied to all herbs and medicinal plants.

The knowledge of medicinal plants must have been accumulated in the course of many centuries. In his work on Plants and Animals under Domestication, Darwin says:—"From innumerable experiments made through dire necessity by the savages of every land, with the result handed down by tradition, the nutritious, stimulating and medicinal properties of the most unpromising plants were probably first discovered." *

The "doctrine of signatures" would also account for the use of several plants as medicinal agents. This doctrine is based on the resemblance in shape or color of some product of the vegetable kingdom with some organ in the animal economy. In the ignorance of anatomical or physiological data to work upon the primitive man thinks that these articles possess some action on those organs which they resemble in shape, size or color. Again, another reason for the extensive use of vegetable drugs may be the fact that plants are everywhere at hand, their number is very great and their forms are distinct and peculiar and thus are procured without trouble.

It is greatly to the credit of the people of India that they were acquainted with a far larger number of medicinal plants than the natives of any other country on the face of the earth. The vegetable Materia Medica of the Greeks, Romans, Egyptians, Jews, Babylonians, Persians, Chinese and Arabs does not display such an extensive knowledge of medicinal plants and drugs as does any of the authoritative medical works of the Hindus. The knowledge of herbs possessed by the aborigines of America, Australia or Africa, is also

"I have this day entered into the waters: we have mingled with their essence." (Wilson's translation of the Rig. Veda. Vol. I, p. 57).

"Thou, *Soma*, fond of praise, the lord of plants, art life to us."

"Be unto us, *Soma*, the bestower of wealth, the remover of disease.
Exulting *Soma*! increase with all twining plants." (Ibid p: 234).

* Vol. I, p. 325.

not very great. Regarding the medicinal agents of the American Indians, Mr. B. F. Stacey says:—

"From a thorough investigation I am convinced that the list is not lengthy, and that there is but little to be learned from their school of practice or repertoire of medicinal agents." *

Mr. J. N. Rose, in his "Notes on Useful Plants of Mexico." says:—

"The country people and Indians seem to have but little knowledge of medicine, generally using teas made of bitter and strong-smelling herbs."

Mr. J. H. Maiden writes in his "Useful native plants of Australia." (Pp. 146-147):—

"In fairness to ourselves we must confess ourselves very little indebted to the Australian aboriginal for information as to the medical (or in fact any other) properties of our plants. The poor aboriginal chiefly takes interest in the vegetation as supplying him with his scanty food, or as affording him fibre useful in securing fish and other animal substance. As far as we know, the Materia Medica of the blacks is of very meagre description, yet the acquisition of even such little knowledge as they are supposed to possess has been slow and difficult, inasmuch as persons who have lived in a state of nature with them have not been distinguished for either their medical or botanical knowledge."

He has very truly observed:—

"With the native Materia Medica of India, for instance, the case is very different. While some remedies are evidently used fancifully, and others for every disease to which the human frame is liable, much of the knowledge in regard to it is exact, the outcome of intelligent observation and enquiry. * *"

It may be that much of the knowledge of plants, once possessed by the ancestors of the present aborigines, has become lost to the world owing to their ignorance of the art of writing.†

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* The Ph. J. of May 30, 1874, p. 958.

† Writing of America one botanist says that "when our forefathers came to this country they found the natives in possession of much medical knowledge of plants. Having no remedies prepared by scientific skill, the Indians were led, by necessity, to the use of those which nature afforded them; and, by experience and observation, they had arrived at many valuable conclusions as to the qualities of plants. Their mode of

But we should not treat with contmpt the knowledge of herbs possessed by aborigines. There can be little doubt that their "medicine men" possess a remarkably accurate knowledge of the medical uses of the plants around them. We should remember that they have taught us the uses of some of our most important drugs. It is to them that we are indebted for our knowledge of Cinchona in malaria, Digitalis, Strophanthus and Physiostigma in heart diseases, and of Quassia as a bitter tonic. We cannot, therefore, sufficiently admire the practical wisdom of the ancient Hindus when they enjoined on the votaries of the healing art the penetration of forests and the climbing of mountains to examine the qualities and properties of the medicines in their natural situations, and gather information regarding them from hunters and shepherds who may have had opportunities of witnessing their effects.*

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life, leading them to penetrate the shades of the forest, and to climb the mountain precipices, naturally associated them much with the vegetable world. The Indian woman, the patient sharer in these excursions, was led to look for such plants as she might use for the diseases of her family. Each new and curious plant, though not viewed by her with the eye of a botanist, was regarded with scrutinizing attention: the colour, taste, and smell were carefully remarked, as indications of its properties. But the discoveries and observations of the Indians have perished with themselves; having had no system for the classification or description of plants, nor any written language by which such a system might have been conveyed to others, no other vestige remains than uncertain tradition of their knowledge of the medicinal qualities of plants."

* That much of the knowledge of medicinal plants by the primitive man was obtained from hunters and shepherds is evident from what Dr. Raymond Crawford, M.A., M.D., (Oxon), Physician to King's College Hospital, London, said in his presidential address delivered before the section of the History of Medicine, reported in the *Lancet* from which it has been reproduced in the *Scientific American Supplement* of April 14 and 21, 1917.

"Man, doubtless, will have acquired much of his knowledge of the nutritive and medicinal value of plants by the same method as the lower animals, by experience. Like them, too, he will have profited by imitation, and imitation embracing his observation of the habits of the lower animals. It must have been of immense importance to man, when he depended largely for food on wild animals captured in the chase, to watch them closely so as to know their habits. * *

"That a good deal of man's medicinal knowledge arose accidentally in his efforts to extend the range of his food supply is suggested by the prominent place occupied by food-stuffs in primitive pharmacy.

The ancient Hindus should be given the credit for cultivating what is now called "Ethno-botany". In Bulletin 55 of the Bureau of American Ethnology, it is said:—

"Ethnobotany is virtually a new field of research, a field which, if investigated thoroughly and systematically will yield results of great value to the ethnologist and incidentally also to the botanist. * * *

Ethnobotanical research is concerned with several important questions:—(a) What are primitive ideas and conceptions of plant life? (b) What are the effects of a given plant environment on the lives, customs, religion, thoughts and everyday practical affairs of the people studied? (c) What use do they make of the plants about them for food, for medicine, for material culture, for ceremonial purposes? (d) What is the extent of their knowledge of the parts, functions, and activities of plants? (e) Into what

About a generation ago, the use of plants and herbs as remedia agents was greatly discredited. The late Sir Thomas Laude Brunton drew an analogy between the weapons and tools employe in art or warfare, and the implements used by man in the treatmen of disease in different ages. It is customary to divide the progres of civilization into four stages, characterized by the nature of th weapons employed. " In the first or Paleolithic age, man employe weapons or tools of flint roughly chipped into shape and unpolished In the next or Neolithic age, the implements consisted of stone, bu they were polished. The next age is characterized by the employ ment of bronze as a material, and the fourth and highest stage b the employment of iron. * * * * In the same way, we may recognis four stages in the development of the implements in the treatmen of disease. In the first stage crude drugs were employed, prepare in the roughest manner, such as powdered Cinchona or metallic anti mony. In the next stage, these were converted into more active an more manageable forms, such as extracts or solutions, watery o alcoholic. In the third stage, the pure active principles, separate from the crude drugs, were employed, *e.g.*, morphine and quinine. In the fourth stage, instead of attempting to extract our medicines from the natural products in which they are contained, we seek to make for ourselves such substances as shall possess the particula action we desire." *

This method had been pursued since the time when Professors Crum Brown and Fraser were able to demostrate the connection between chemical constitution and physiological action. With the help of the advanced chemistry of modern times, an attempt to establish rational therapeutics was being made by the leading pharmacologists of the world. Thus the employment of inorganic salts and chemical principles obtained from the vegetable kingdom, which

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categories are plant names and words that deal with plants grouped in the language of the people studied, and what can be learned concerning the working of the folkmind by the study of these names?

Ethnobotany will become a more important subject when its study has progressed to a point where results can be studied comparatively.

A prime necessity is a good native informant; indeed it is better to have several informants, preferably older men or women."

What a pity that hardly any attention is paid to this subject in modern India.

* *The British Medical Journal* for August 14th, 1886, p. 326.

had been much in vogue about half a century ago, was being gradually abandoned in favor of derivatives obtained from coal-tar and various alcohols. As was once pointed out by the authors of the Extra Pharmacopœia, "the place in medical treatment, of quinine and morphine, the two mainstays of the medical practitioners of twenty years ago, is in a great measure filled by antipyrin, antifebrin, phenacetin, exalgine, and salicylate of sodium on the one hand, and by sulphonal, tetronal, chloral, etc., on the other."* The day was eagerly looked forward to when the articles of our organic materia medica were to be supplanted by the creations of the chemist.

Analogy however is no safe guide in science. So Brunton's comparison of the different articles of Metria Medica to the weapons of the different geologic periods, is, to say the least, very fallacious. There is something like what may be called "Fashion in medicine." It is due to this "fashion," that some of the good old remedies are labelled "out of fashion." For long it was not considered fashionable to use crude herbs. Synthetic remedies were the fashion of the day. It is not only the great war which is now raging in Europe that has made the pendulum of fashion swing from one extreme to the other, but the oscillation was visible even a considerable time before the outbreak of the War.

Thus a reaction seemed to have set in, in favor of plants being used as medicines. Referring to the use of the Bilberry (Vaccinium Myrtillus) as a remedy in Typhoid fever and other infectious diseases of the intestine—a paper read by Dr. Max M. Bernstem, M.B., before the Hunterian Society of London and published in the *British Medical Journal* for 7th February, 1903,—Sir James Sawyer, M.D., London, F.R.C.P., Senior Consulting Physician to the Queen's Hospital; and Ex-Professor of Medicine in the Queen's College, Birmingham, wrote in the *British Medical Journal* for February, 4, 28th, 1903:—"Long have some of us dwelt with affection, and with hope of finding modern uses for some old drugs which were being lost to sight and to memory in the limbus of the past, and perhaps not without some practical success, upon the archæology of our Medicinal

* Extra Pharmacopœia by Martindale and Westcott. Preface to the sixth edition, p. III.

"Simples," upon the histories and lore, upon the forms, virtues, and renown of many old-time Medicinal plants, upon plants called simples because each of them has been held to enshrine its particular curative virtue, and so to furnish a simple remedy for some symptom of disease, or for some individual morbid manifestation. Perhaps we have loved to walk, as Evelyn did, "into a large garden, esteemed for its furniture one of the fairest, especially for simples;" or perhaps we have followed our own Garth, "when simpling on the flowery hills he strayed."

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"True is it to-day as when Sir Thomas Watson so declared a third of a century ago that 'the greatest gap in the science of Medicine is to be found in its final and supreme stage—the stage of therapeutics.' Therapeutics advances by our increasing knowledge of the nature of morbid processes and of the physiological effects of remedies, and also by studying again many a good old drug by the light of later scientific methods and also by judicious selection from the traditions of popular medicine. Such selection gave us Digitalis."

Dr. Ischirch, Professor of Practical Chemistry in the University of Berne, is reported in the *Lancet* of 2nd October, 1909, to have said:—

"We may assuredly hope that medicine, when it has thoroughly ruined its digestion with synthetical remedies and tested all the organs of the animal body, will return to the most ancient remedies of mankind, to the medicinal plants and drugs, for the utility of which the experience of the thousands of years vouches."

There were other medical men also who were coming to look upon drugs of synthetical origin acting upon the system as foreign bodies, depressing and paralysing its functions. But according to them such was not the case with the drugs of vegetable origin which in their natural combination meet nutritional conditions of the system. The possibilities and potentialities of medicinal plants and vegetable drugs have not been as yet properly and fully studied. In an article on "the teaching of chemical medicine," in the *British Medical Journal* of 3rd January, 1914, Dr. Mackenzie wrote that:—

"Not one single drug has been carefully studied so as to under-

stand its full effects on the human system, effects that could be easily recognised had a systematic examination been carried out when it was administered in the hospital wards."

The above observation of Dr. Mackenzie is fully borne out by what Dr. Charles J. Macalister, M.D., F.R.C.P., has discovered as reported in the *British Medical Journal* of January 6, 1912, in *Symphytum officinale*, a plant known as "comfrey" in England. He considers it as a "potent cell proliferant." It was a long forgotten remedy which was used in olden times to heal ulcers. On analysis, the root of the plant was found to contain allatione to which Dr. Macalister attributed its action as a potent cell proliferant.

Dr. William Bramwell, M.A., M.D., B.Ch., of Liverpool, concluded a note on the above-named plant published in the same issue of the *British Medical Journal* in the following significant words.

"It is indeed refreshing and gratifying, in these days of serums and vaccines and highly complicated preparations, *the administration of which, in some cases, is fraught with the gravest possible danger and soul-harrowing anxiety on the part of the administrator*, to find a physician of Dr. Macalister's standing setting on foot the investigation of so simple and natural a remedy as common comfrey."

The present war has shown the necessity of using herbs and plants in preference to Synthetics. The President of the Botanical section of the British Association held at New Castle in 1916, very truly observed, regarding the medicinal plant industry, "Experience would indicate that here is opportunity for investigation, and, unless due care is taken, also danger of waste of time, money and effort. A careful systematic study of species, varieties and races is in some cases desirable in order to ensure the growth of the most productive or valuable plant; and such a study might also reveal useful substitutes or additions. Here the co-operation between the scientific worker and the commercial man is imperative.

The study of medicinal plants is neglected by medical men all over the world, but more so in India. These are contemptuously referred to as "old women's" remedies.* It is our misfortune that

* Dr. John Foote, Associate Professor of Materia Medica and Therapeutics, Georgetown University, Washington, writes of the importance of Trees in Medicine as follows:—

the chemistry and pharmacology of most of these plants have not been properly investigated.

The late Right Hon'ble Mr. Gladstone was a man of extraordinary genius. As a scholar, politician, and statesman he will ever shine in the pages of English history as long as England is not effaced from the map of the World. In the course of a speech, delivered on the 26th March, 1890, on the occasion of the opening of Guy's Hospital Residential College, referring to the importance of the study of Botany with a view to learn the "qualities of plants which are so remarkable and powerful in their healing capacities," he said:—

"I am not aware whether Botany now forms a recognised branch of the medical education, but I cannot help wishing that it did, and hoping that it may in the future, first of all, not only because it is in itself a most beautiful and interesting study exercising the mind without fatiguing it, and stimulating the imagination without leading it astray, but also, because I cannot help wishing, although I know it is too much to expect of our actual medical men, that they should be careful observers of nature, yet in their younger years, before they have entered on their great career, I cannot help wishing that they had the habit of noticing all the qualities of plants which are so remarkable and powerful in their healing capacities." Then Mr. Gladstone narrated an anecdote, how the leaves of a plant healed the cut on his finger caused by an axe in wood-cutting.

"You will think it ludicrous, if I were to tell you a little anecdote of my own, which is of the very simplest character, and it is so small and so slight as almost to be contemptible, but still it illustrates what I mean. I have been given, as is pretty well-known, or at least, I have been given to the pursuit of wood-cutting. From a pure accident, I drew my fingers the other day along the edge of the axe which was lying close by, and which was tolerably sharp, and cut my finger. Upon searching about me I found I had no handkerchief available. I wanted to staunch my little wound. Not having a handkerchief, I got a leaf and put it on the wound. I am bound to say that this was not the result of botanical knowledge, but it was a purely empirical proceeding on the chance of the quality of the leaf. But there was a curious result. I knew the time nature occupied in healing a little

"And yet, in spite of the pharmaceutical image breakers and the therapeutic nihilists, some of the most valuable remedies used in medicine come from trees. * * *

"And if, as has been asserted, the decadence of Rome was really due to malaria, and if her glory was obscured by a cloud of mosquitoes rather than by the dust of battles, then it may be that the possession of some cinchona and the planting of the eucalyptus in the Roman marshes might have prevented a great civilization from withering and fluttering away and changed the countenance of history." [Scientific American Supplement, January 13, 1917, p. 26.]

breach of continuity, and when I put on the leaf, I assure you it is the fact, that it healed in exactly half the time. It is hardly worth mentioning such a thing as I say but I cannot help having the belief that there are good treasures in nature more than have heretofore been explored in every branch. To make medical students, before they have come to their great responsibilities, observers of the great qualities and capabilities of plants, I cannot help thinking that some good will be done." *

The importance of studying the subject of Indian medicinal plants has been again and again insisted on by several writers. It is too late in the day to discuss the necessity of such a study. The ease and cheapness with which these are procurable, the marvellous powers that are attributed to them in the cure of different maladies by natives of India, should induce us to investigate their properties and settle once for all their claims on our attention.

Dr. John Lindley was a renowned botanist. His views on the subject of vegetable drugs deserve careful consideration. In the preface to his work on *Flora Medica*, he wrote:—

"No one will be bold enough to assert that the physicians already possess the most powerful agents produced by the vegetable kingdom; for every year is bringing some new plants into notice for its energy, while others are excluded because of their inertness. In tropical countries, where a fervid sun, a humid air, and a teeming soil give extraordinary energy to vegetable life, the natives of those regions often recognise the existence of potent herbs unknown to the European practitioner. No doubt such virtues are often as fabulous and imaginary as those of indigenous plants long since rejected by the sagacity of European practice. But we are not altogether to despise the experience of nations less advanced in knowledge than ourselves, or to suppose, because they may ascribe imaginary virtues to some of their officinal substances, as has been abundantly done by ourselves in former days, that therefore the remedial properties of the plants are not worthy of serious investigation or that their medical knowledge is beneath our notice because they are unacquainted with the terms of modern science. It is not much above 20 years since an English officer in India was cured of gonorrhœa by his native servant, after the skill of regular European practitioners had been exhausted. The remedy employed was Cubebs, the importance of which was previously unknown, and the rationale of whose action is to this day beyond the discovery of physiologists. It is of undoubted value in urethral catarrh; and who shall say that there are not hundreds of equally

* Guy's Hospital Gazette for 29th March, 1890, p. 72.

powerful remedies still remaining to be discovered. * * * and it must be sufficiently apparent to all unprejudiced minds, that the resources of the vegetable kingdom, far from being exhausted, have hardly yet been called into existence. It is presumptuous for the theorist to assert that he already possesses a remedy for all the maladies that flesh is heir to; it is mere idleness in the routine practitioner, carried away by the attraction of spacious generalities, to fancy that one tonic is as good as another tonic, or one purgative as another purgative. In reality the true cause of the different actions of medicines upon the human body is admitted by the highest authorities to be wholly unknown; and surely this is in itself the best of all reasons why we should not assume that we already possess against disease all the remedies which nature affords; on the contrary, it should stimulate us to reiterated enquiries into the peculiar action of new remedial agents. * * * "And they (*i.e.*, European practitioners) find the medicines which are powerful in Europe, comparatively inactive in other climates. The heat of a country, its humidity, particular localities, food, and the social habits of a people will predispose them to varieties of disease for which the drugs of Europe offer no sufficient remedy, and will render that which is relied upon in one country unworthy of dependence in another. Thus the Cinchona bark of Peru, important as it is in Europe, is, we are told, rejected by the people among whom it grows, because it is found too stimulating and heating for their excitable constitutions. And speaking of Ipecacuanha, Dr. Von Maritus, who so carefully examined practically the Materia Medica of Brazil, asserts "nullumest dubium quin Emetica in terris zonne fervedae subjects effectus producent multo magis salutares quam in regionibus frigidioribus."

"This last observation seems to indicate, that if emetic plants are so much more common in hot than cold countries, it is because there is so much greater a necessity for them. The late Mr. Burnett, and many other persons, have asserted that every country spontaneously furnishes remedies for those maladies which the people of the soil are naturally subject to, and that the foreign drugs imported into the markets of Europe would soon be superseded to a great extent, if the properties of European plants were carefully examined. It is contended, in illustration of this opinion, that Salicine, obtained from our native Willows is equal in energy to Quinine, and that it is formed by Providence in low marshy places exactly where remittent and intermittent fevers are experienced most frequently, and with the greatest severity * * * * * * * *

"Such a subject of investigation is by no means unimportant when it is considered * * * that exotic drugs are not only costly, but often so much adulterated as to be unfit for use * * * *

"It by no means follows that plants are inert because medical men have

reported unfavourably of their action. The most powerful species have had their energy destroyed by unskilful preparation, or by not knowing at what season to collect them. * * * * * * the very nature of the climate of tropical countries generally causes the properties of plants to be more concentrated and completely elaborated than in Northern latitude."

II

So far the indigenous drugs have not been carefully and systematically studied. The Executive Committee of the Calcutta International Exhibition for 1883-84, reported that "it must be admitted that our ignorance of the properties and uses of indigenous drugs is scarcely pardonable. It seems highly desirable that the whole subject should be gone into with greater care than has yet been done, both with the view of weeding out the worthless from the good, and of preparing the way for a number of the better class native drugs taking the place of some of the more expensive and imported medicines of Europe. It seems remarkable that so large an amount of aconite should be collected in Nepal and exported to Europe, in order to be re-imported into India before it can find its way to the poor people who crowd around our dispensaries. Illustrations of a similar nature can be multiplied indefinitely. *Atropa Belladonna*, the deadly nightshade, for example, is a common weed on the Himalayas from Simla to Kashmir, yet every ounce of the drug used in India is imported from Europe, the Indian plant having apparently been entirely overlooked." *

But for the proper study of the subject, a work exclusively devoted to Indian medicinal plants has been a great desideratum in the medical literature of India. Messrs. Hooker and Thompson writing as far back as 1855, said:—

"We have had a considerable experience both in medical and economic botany, and we announce boldly our conviction that so far as India is concerned these departments are at a standstill for want of an accurate scientific guide to the flora of that country." †

The flora of British India commenced by Sir Joseph Hooker in

* Official Report of the Calcutta International Exhibition, 1883-84, Vol. I, pp. 316-317.
† Introductory Essay to the Flora Indica, p. 3, London, 1855.

1872 is now completed. The great value of this work as a scientific guide to the plants of this country can hardly be doubted. The foundation of a medical botany of India should be grounded on this work. In this medical botany should be included all the plants that are used medicinally by the natives of this country. A very large number, perhaps the vast majority of these plants, will be found perfectly useless, but in the present state of our knowledge we are not justified in excluding any from the list. The great aim of this work being to collect and identify the medicinal plants of the country, it should, after giving the plants its modern scientific name, insert the synonyms under which it was known in former times.

The value of Sanskrit and vernacular names of plants has been much questioned by botanists for purposes of identification. But, I think, these synonyms help a great deal towards identification.*

* The importance of Sanskrit names of plants was fully understood by Sir William Jones, the President Founder of the Asiatic Society of Bengal. More than a century ago he suggested that "the first step in compiling a treatise on the plants of India should be to write their true names in Roman letters, according to the most accurate orthography, and in *Sanskrit* preferably to any vulgar dialect; because a learned language is fixed in books, while popular idioms are in constant fluctuation, and will not perhaps be understood a century hence by the inhabitants of these Indian territories, whom future botanists may consult on the common appellations of trees and flowers." (Sir Wm. Jones' Works, Vol. II, London, 1799, p. 2.)

On another occasion Sir Wm. Jones said:—

"I am very solicitous to give Indian plants their true Indian appellation; because I am fully persuaded, that Linæus himself would have adopted them, had he known the learned and ancient language of this country. * * * Far am I from doubting the great importance of perfect botanical descriptions; for languages expire as nations decay, and the true sense of many appellatives in every dead language must be lost in the course of ages; but as long as those appellatives remain understood, a travelling physician who should wish to procure an Arabian or Indian plant, and without asking for it by its learned or vulgar name, should hunt for it in the woods by its botanical character, would resemble a geographer, who, desiring to inquire by name for a street or a town, but waits with his tables and instruments for a proper occasion to determine its longitude and latitude." ("Botanical Observations on select Indian Plants." Sir Wm. Jones' Works, Vol. II, p. 47, London, 1799.)

In Sanskrit every plant bears several synonyms which may facilitate in tracing the history and identification of the plant.

"Every single word in Sanskrit," writes Professor Sir Monier Williams, "is referred to *dhatu* or root which is also a name for any constituent elementary substance, whether of rocks or living organisms. In short, when we follow out their grammatical system in all the details of its curious subtleties and technicalities, we seem to be engaged, like a geologist, in splitting solid substances, or like a chemist, in some elaborate process of analysis." (Preface to Sanskrit Dictionary, p. vi.)

These Sanskrit synonyms to be of any use, should be accompanied with a literal translation into English.

Mr. C. B. Clarke does not think that the vernacular names of plants help much in identifying them. For he says:

"I have observed that the eagerness to get native or vulgar names for plants is directly proportioned to the ignorance of the enquirer, those who know nothing about

Much trouble will be saved to the experimenting physician by the help of the country names of plants. Modern India abounds with professional herbalists. There are the Musheras in Central and Upper India, whose principal livelihood consists in the collection and sale of medicinal roots and herbs. *

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the plants and who are unable to discriminate them under any names being always loud in their call for native or local names."

Again, "as to the grand Sanskrit names, they are of still less value than the vulgar ones, being founded on less actual observation, with the object of enriching the language." (Preface by Mr. Clarke to his Edition of Roxburgh's Flora Indica, p. ii, Calcutta, 1874).

I think these remarks of Mr. Clarke are not quite justifiable, and they are not shared in by other eminent botanists. For instance, Sir David Brandis, who has been called the "Father of Indian Forestry," says regarding the vernacular names of plants, :—

"The critical examination of the vernacular names of the different Indian languages, and their derivation from the Sanskrit or other roots, will be found a most interesting and important study. * * * * The forester should not despise vernacular names, for in many instances they have a fixity which systematic names do not yet possess. We all know the ever green *Khirni*, and there can be no mistake about it; but botanists are not yet agreed whether the tree shall be called *Mimusops indica*, *hexandra* or *Kauki*. Kamela or Kamila is a well-known small tree, its systematic name among Indian botanists, however, which for more than half a century was *Rottleria tinctoria* has now and properly been changed into *Mallotus philippinensis*. Again, there can be no doubt as to the tree designated by *kao kan*. Although some botanists call it *olea europea*, others *olea cuspidata*, and others *olea ferruginea*. * * * These changes of systematic names are not arbitrary—as a rule, they are dictated by the progress of scientific research; but they are apt to discourage the student, and on that account, also, vernacular names merit attention." (Forest Flora of N. W. India, Preface: pp. xi and xii, London, 1874).

When the Pharmacopœia of India was issued, it was considered a great defect in the work that it had not given the vernacular names of the plants. In reviewing the work, a writer said:—

"Many of the non-officinal remedies, the introduction of which to regular practice is avowedly one of the objects of the publication of this Pharmacopœia, are dismissed without a single vernacular name for them being given. The recommendation, for example, of the committee, that *Hymenodictyon excelsum* should be looked to as likely to prove a valuable specific for malarious fevers, is pretty certain to be quite thrown away on a medical officer, who is not an expert in botany, for not a single native name for this tree is given eihter in the book itself or in the index; and though it might happen to grow in forests round his station, the committee put him in possession of no means of recognising it. * * * This very grave defect in the Pharmacopœa, cannot be removed by the publication of a separate catalogue of native names, as proposed. In a second edition we hope to see not only a full vernacular index, but to find, following the botanical name of each substance, as complete a list as possible of the vernacular synonyms for it which are current in the three presidencies." (Calcutta Review for 1869, p. 201.)

All the above extracts will show that the importance of vernacular names of plants is fully recognised by those whose opinion is entitled to respect on this subject.

* An excellent account of this tribe is given by Mr. J. C. Nesfield, M.A., Inspector of Oudh Division, Lucknow, in the Calcutta Review for January, 1888. Mr. Nesfield writes:—"Indian physicans (Vaidya) and Indian druggists (Pansari) are almost dependent as far as medicines are concerned, on what Musheras supply to them. * * It is much to the credit of Musheras that they have given a marked preference to the study of nature, and opened the door to the discovering of natural remedies. In fact, their knowledge of medicine is one of the chief characteristic of this tribe. * * They collect medicinal herbs for sale and receive grain or money for what they supply. * * *

In Bengal there are the Mâlîs, Bâgdis, Kaibartas, Pods, Chandals, Kaoras and Karangas, who principally carry on the trade in jungle products.* In Bombay, the Chadras, Bhils, and Gamtas are the herbalists. Now, these communities can prove of immense service to our medical practitioners in supplying medicinal plants. But as they are not trained in any university so as to be able to understand the Latin or scientific names of plants, the only way to secure their services lies with the medical practitioners in mastering the native names of plants. A great deal of time and trouble will be saved by thus giving the vernacular names of plants the importance they deserve.

It is, however, proper to add that too much confidence can not be placed in the vernacular nomenclature. In India, in the same district, one and the same name is applied to two or more different plants. And in some instances, names without any significance are invented by villagers to satisfy the curiosity of enquiring botanists. These names are of no use. Such being the case, a knowledge of botany to critically examine a plant is absolutely necessary.

Besides botanical description and vernacular nomenclature, illustrations of plants prove a great help in identifying them. Though illustrations of several thousands of Indian plants are scattered in the works of Rheede, Roxburgh, Royle, Wight, Wallich, Beddome, Brandis, and Griffith and in the journals of the Linnan and other learned societies, yet a very large number of medicinal plants of this country remains to be illustrated.† The sooner illustrations of these plants are made the better for the cause of the study of indigenous drugs.

After proper means have been taken to identify the medicinal plants, so that we are quite sure that we all mean the same thing by the same name, we should turn our attention to the study of their properties and uses. We may commence such study with advantage, and it will be, moreover, of historical importance, if we first of all take into consideration the uses to which these plants were put in

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I know of no parallel to such knowledge as that possessed by Musheras within India itself." (Calcutta Review, pp. 40-41, for January, 1888.)

*Hunter's Statistical Account of Bengal, Vol. I, p. 27.

†Most of the above-mentioned works, however, are out of print, and being rare, are hardly within the reach of the most of the members of medical profession.

ancient times by the Hindus. With this view, we should consult the medical works of the Hindus, *e.g.*, Charaka, Sushruta, Nighantu, etc.

Nor should we despise the experience and observation of the Greco-Arabic School of practitioners regarding the uses of the indigenous drugs. Thus the Taleef Sheriff (which has been translated into English), is an excellent work on therapeutics, and gives within a narrow compass the uses of some of the most important medicinal plants of this country.

We should also take into consideration those drugs which are in much use among rustics and villagers, and of which no account is to be met with in the works of either the Hindu or Greco-Arabic school of practitioners. It is a pity that no attempt has yet been made to collect information from the villagers regarding the medicinal virtues of plants that grow around them and the uses to which they are put. * If we turn to the past history of our art, we find that our knowledge regarding the properties of some of the most useful medicines has been obtained in this empirical way.

Lastly, we should not neglect to bestow our attention on those indigenous plants which have not been used medicinally by the natives of this country, but are in much use in other countries.

After recording the medicinal uses, we have to commence the more important subject, *viz.*, that of "weeding out the worthless from the good" amongst these medicinal plants. For this purpose, we have to seek the aid of chemistry. It is well-known that plants generally owe their virtues as medicinal agents to certain characteristic alkaloids and principles present in them. Because a complete and full chemical analysis of the medicinal plants of this country has not yet been performed, it is therefore that there exists so much uncertainty regarding their actions. This isolation of principles will constitute a great improvement in pharmacy. For, then, instead of using preparations made from plants which differ in constitution from time to time, and vary in the strength of their active principles and physiological characteristics, depending on the climate, season, and amount of sunshine under which, and the soil

* *Vanausadi Prakas*, by Mr. Vasudev Chintaman Bapat, in Mahrathi, is as far as I know, the only work which gives the uses to which some of the medicinal plants are put by the natives of Concan.

in which, they have grown, we should use the active principles in which the same variability is unlikely to occur. Moreover, they would possess the advantages of being always alike, easily assimilable and capable of ready solubility, ease in administration and rapidity as well as certainty of action. Then a practitioner also could carry his whole dispensary in a portable form.*

This chemical analysis would also help us in determining the actions of medicines in health and disease. It should, however, be borne in mind, that chemical analysis but imperfectly reveals the real nature of many drugs. The presence of dissociated ions, of colloidal metals, with an action analogous to that of ferments, and of known and unknown physical properties, such as radio-activity, probably enter into the action of many drugs. All the phenomena of plant life are not explicable in terms of chemistry and physics; there are certain residual phenomena which point to the existence of what may be called in the present state of our knowledge, "vital force." †

It is hence, that many medical practitioners have been disappointed with tinctures and other preparations of medicinal plants, because such preparations did not give any satisfactory results when prescribed to patients. Speaking of *Oolut-Kumbal,* (Abroma augusta) Dr. Bhoobun Mohan Sirkar wrote in the Indian Medical Gazette for May, 1900:—

"Attempts have been made to administer the drug in the more acceptable forms of tincture, pill or powder, but none prove so efficacious as the fresh viscid sap in substance in which form I have used it with wonderful results."

It is well-known that the people of India use the juice of fresh vegetables for medicinal purposes. But on chemical analysis, these vegetables do not yield any peculiar chemical substances to which

* Biochemistry of plants and animals has not yet been fully investigated. We do not know even much about the function of enzymes, regarding which two views are held, one that they are a property and the other that they are a substance. Chemistry cannot produce them. They are found only as the products of protoplasm of living cells. It may be that many processes taking place in living cells are the results of Enzyme activity.

† The alkaloids have all been discovered within the last 100 years. For want of chemical investigation indigenous drugs are used in their crude forms, instead of their alkaloids or active principles. Brunton's "Iron Age of Therapeutics," is one of remote and uncertain future, but I believe a great deal of iron, if not steel, can be extracted, very useful for all practical purposes from the stones in the shape of our indigenous drugs.

their curative virtues could be justly attributed. It has been the tendency of late, therefore, to disapprove the use of such vegetable remedies. A well-known medical man writes in Allbutt's System of Medicine:—

"The chemical composition of a drug is not unfrequently the key to its pharmacological action.........If a drug have no active properties, it is surely devoid of medicinal effect unless it be a food; for medicinal action is the outcome of the effects of active principles on tissues. It is always possible that in any particular drug the active medicinal agent may have escaped notice; but in the present state of chemical science it is not likely that undiscovered principles reside in such substances as sarsaparilla and hemidesmus: yet these drugs are given on the testimony of experience,—a testimony no stronger than that which has supported scores of other agents eventually discarded. If the indications, given by the pharmacological examination of a drug, are opposed to experience in its favour, the latter must almost certainly be at fault." *

But clinical experiences and observations of eminent physicians on the actions of a drug are as much entitled to respect and consideration as its pharmacological examination. So the view of the writer quoted above does not seem to us to be sound.

The modern method of therapeutical investigation is, first, to observe the action of a drug on a healthy animal, and then to make the results applicable to pathological states. The ancients recognised only one mode of studying the effects of a remedy, and that was by the simple observation of effects produced by drugs when administered in disease. The clinical observation of the action of remedies has been productive of some good, but it is questionable if much progress was effected so long as this method alone was employed. Towards the beginning of the nineteenth century, the necessity for ascertaining the actions of remedies by experiments on animals, was recognised by Bichat, Majendie, and others. This modern method of therapeutical research promises a great success. Working on this line, Lauder Brunton was able to use with success nitrite of amyl in angina pectoris. Here a correct application of a known action in a

* Dr. D. J. Leech in Vol. I of Allbutt's System of Medicine, London, 1896.

drug was made serviceable in the very first trial. The pharmacological experiments and clinical observations will thus settle the claims of Indian drugs on our attention.

III

The Vedic Aryans were acquainted with about a hundred medicinal plants. When a king appoints a Purohita, he repeats a prayer in which he entreats that all the herbs of a hundred kinds over which King Soma rules will grant him uninterrupted happiness.

From the works of Charaka and Sushruta we learn that the Indo-Aryans were acquainted with a large number of medicinal plants. In Sushruta are recorded the properties and uses of some 700 of them; but all of these were not indigenous to India. Some foreign drugs were imported into this country. In ancient times there was a trade in drugs between the Hindoos and other nations. Liquorice, which does not grow in this country, was extensively used in Hindoo Medicine. It grows in Asia Minor and Central Asia, and was brought to this country by the nomadic tribes of Central Asia. We find mention of it in Charaka and Sushruta. The majority, however, of the medicinal plants in these works were indigenous to this country. Their properties were known by empirical means. Information regarding them was gathered from hunters and shepherds. For this purpose, physicians were enjoined to penetrate forests and climb mountains.

The works of Charaka and Sushruta appear to have been composed in the pre-Buddhist period. The rise of Buddhism gave an impetus to the study of medicine in ancient India. The edicts of Asoka provided the establishment of hospitals at all principal towns and cities of India for the sick and the wounded. The Buddhist missionaries penetrating the dreary wilderness of Siberia and Central Asia preaching the tenets of benevolence and humanity to the savage tribes, also attended to treating the sick and the wounded. They were in one sense medical missionaries. The teachings of the Hindoo system of medicine were also spread to the countries which adopted Buddhism. The Buddhist missionaries brought with them drugs of

other nations to India, and thus enriched the materia medica of Hindoo physicians.

The Greek invasion was not without influence on the medical practice of ancient India. The *savants* who accompanied the army of Alexander learnt much of the metaphysical, philosophical, and medical systems from the Hindoos. The successors of Alexander brought Greece and India into closer contact. Commerce was established between the two countries. It was thus that a large number of drugs of Central Asia and Asia Minor found their way to India. Greek physicians also came to know several medicinal plants of this country. As the Greeks learnt much of the healing art from the Hindoos, so the latter were indebted for their knowledge concerning several foreign drugs to the Greeks.

The rise of Muhammadanism brought about a new era in the history of civilization. The Arabs paid great attention to the cultivation of science and art. Although they did not discover or invent anything new, yet they preserved most of the known sciences of the ancient world. Without them, it is doubtful if the modern world would have been in possession of the philosophical and scientific lore of the Greeks or the Hindoos. Hindoo physicians adorned the court of the rulers of Bagdad. Medical works of the Hindoos such as Charaka, Sushruta, Nidâna, &c., were translated into Arabic. The teachings of Hippocrates, Democritus, and other Greek physicians were made known to the world by the countrymen of Muhammad. When India came to be under the Islamic power, Muhammadan physicians known as Yunani Hakims were patronized by the court. They were versed in the medical lore of the Greeks. They brought with them the teachings and doctrines of the Greek masters of the healing art, and also made known the properties and uses of several drugs of Central Asia. The Hindoo system of medicine, on the rise of the Muhammadan power, came to a stand-still; but the Hindoos were not slow in making use of those drugs which their Muhammadan conquerors had made known to them. Of all the drugs perhaps the most important one imported into India by the Muhammadans was opium. Before the Muhammadan supremacy in India, there is hardly any mention of opium to be met with in Hindoo works of Materia

Medica. The principal works of Hindoo Materia Medica composed during the Muhammadan period of Indian history are:—

(1) *Râja Nighantu,* by Narahari Pandita. Regarding this work, Professor H. H. Wilson writes that "from the frequent occurrence of the Dakhini terms in explanation of his Sanskrit text it is inferred that he was an inhabitant of the south of India." The date of composition of this work has been fixed by the same authority at some time between the 12th and 13th centuries. (*Vide* H. H. Wilson's Works, Vol. V., p. 237.)

(2) *Madana Pâla Nighantu,* by Madana Pâla, a king of Kanauj. The late Raja Râjendra Lâla Mitra placed the date of composition of this work somewhere in the twelfth century (*vide* R. L. Mitra's Notices of Sanskrit MSS. II, p. 264).

(3) *Bhâva Prakâsa,* by Bhava Misra. It treats of Anatomy, Physiology, Medicine, Surgery, Materia Medica, and Therapeutics. Its date has been fixed at about the sixteenth century.* This work gives a very concise and clear account of all the medicinal plants and animal and mineral substances used medicinally by Hindoo physicians.

Yunâni Hakims, that is the Muhammadan physicians of India, also have written a great deal concerning the indigenous drugs of this country. The encouragement accorded to Muhammadan physicians by their rulers led them to produce many meritorious works on medicine. Under the patronage of the court of Delhi, the Yunâni Hakims vied with one another in paying attention to the study of indigenous drugs. Their works are however not of any antiquity. The *Taleef Sheriff* is a monograph, clearly setting forth the views of Yunâni Hakims on indigenous drugs. The *Makhzan-ul-Adwiyâ,* which has been made much use of by Dr. Dymock in his Vegetable Materia Medica of Western India, is also another important work on the subject. There are several other works by Muhammadan physicians, some in Persian, and others in Urdu, treating of indigenous drugs.

It is during the Christian period of Indian history, that our knowledge regarding indigenous drugs has been much increased by

* The late Dr. U. C. Dutt has given strong reasons for the work being a production of the sixteenth century, see introduction to his Materia Medica of the Hindoos.

the investigations and labors of botanists and physicians. The three myrobalans of the East were eagerly sought after by the early Portuguese discoverers of the sea-route to India. Indian spices were also made known to Europe by them. Informations concerning the drugs of this country are scattered in the works of European travellers and navigators to this country during the sixteenth and seventeenth centuries.* At the same time several foreign medicinal plants, especially of America, were brought to and naturalized in India by the Portuguese, Dutch, and other maritime nations. *Agave Americana, Ananasa sativa, Anona squamosa,* and several other native plants of America are now to be met with throughout the peninsula of Hindustan. Von Rheede tried to gather all the informations about the medicinal uses of the plants of this country in his *Hortus Malabarica,* which should be looked upon as the first systematic work by a European, giving the medicinal uses of the plants of India. But little attention was paid to the medicinal plants of this country till the foundation of the Asiatic Society of Bengal. The Society was established mainly through the exertions of Sir William Jones, who was its first president. He was as great a botanist as a classical scholar. He looked upon the Society as corresponding in its aims and objects to the Royal Society of England. The Asiatic Society has fulfilled the expectations of its gifted founder. Sir William Jones himself pointed out the importance and necessity of studying the Indian medicinal plants. In a paper on the design of a treatise on the plants of India, read by him before the Bengal Asiatic Society, he said that "Some hundreds of plants which are yet imperfectly known to European botanists and with the virtues of which they are wholly unacquainted, grow wild on the plains and in the forests of India. The *Amarakosha,* an excellent vocabulary of the Sanskrit language, contains in one chapter the names of about 300 medicinal vegetables; the *Medini* may comprise many more; and the *Dravyâbhidhâna* or Dictionary of natural productions includes, I believe, a far greater number, the properties of which are distinctly related in medical tracts of approved authority." †

* A very important work was that of Garcia D'orta, named Colloquios does simples e droges da India. This has been lately translated into English.

† Sir Wm. Jones' Works, London, 1799, Vol. II, p. 2.

The example set by Sir William Jones was not lost upon his successors. Roxburgh, the Linnaeus of Indian Botany, collected all the informations about the medicinal plants of this country in his Flora Indica. Professor Lindley in his work on Flora Medica is indebted for his information regarding the medicinal plants of India to Roxburgh's *magnum opus.* Roxburgh's Flora Indica was an authority on the medicinal plants of this country till the publication of the Pharmacopœia of India. Mr. Clarke in his edition of Roxburgh's Flora Indica writing in 1874, truly observed that " Roxburgh contains all the Economic Indian Botany known to him, and we have added very few economic facts since. * * * We have had plenty of Government and other reports, some very large and expensive ones it is true, but we have very little economic work by persons competent as botanists. * * * Roxburgh is most trustworthy in his Economic botany, and contains virtually all that is known on the subject." *

In the beginning of the nineteenth century, John Flemming contributed a valuable paper on the medicinal plants of this country. It was a monograph of no inconsiderable value and was published in the Asiatic Researches, Vol. XI, for 1810 under the title " A Catalogue of Indian Medicinal Plants and Drugs with their names in Hindustani and Sanskrit." For the first time, the scattered information on the subject was collected and placed before the medical profession.

The most important work, a work which is referred to by all writers on indigenous drugs composed during the early part of the last century, was the Materia Indica of Ainslie. He spent the period of his Indian exile in Madras, and has given a very satisfactory account of the drugs in common use in that Presidency.

The formation of the Medico-physical Society of Calcutta, contributed not a little to the study of indigenous drugs. In the Transactions of that Society were described for the first time some of the vegetable drugs of this country. Wallich, Horace Hayman Wilson, Dewan Ram Comal Sen, and several others brought to the notice of the profession many native remedies.

* Clarke's edition of Roxburgh's Flora Indica, Calcutta, 1874, Preface, p. iii.

The labors of Dr. J. F. Royle deserve special mention; for he paid especial attention to the economical plants of this country. The Botanical Gardens of Saharanpore owe a great deal to his labors. In his works on the Antiquity of Hindoo Medicine, Materia Medica, and Botany of the Himalayan mountains, he brought to the notice of the medical profession several medicinal plants in common use amongst the inhabitants of India. The advantages which Saharanpore possesses for the naturalization of plants of the colder regions induced him to try and cultivate the medicinal plants of other countries. He also contributed an excellent paper on the Bazar medicines to the Journal of the Bengal Asiatic Society.*

Mention should also be made to the lobors of the Agri-Horticultural Society. The Society with its branches in different parts of India has rendered some help to the cause of indigenous drugs, as is evident by the Transactions of the Society.

Sir William O'Shaughnessy, who was the first Director of Telegraphs in India and occupied the chair of Chemistry at the Medical College, Calcutta, spent many years in investigating the subject of indigenous drugs. Several drugs were for the first time chemically analysed by him. Dr. Wallich, who was at that time in charge of the Calcutta Botanical Garden, rendered him much help in identifying the medicinal plants of India. The combined labors of O'Shaughnessy and Wallich have produced the valuable pharmacopœia of Bengal, published under the authority of the Government of Bengal in 1844. No pains were spared by O'Shaughnessy to make use of the labors of his predecessors. The publication of this work gave a fresh stimulus to the study of indigenous drugs. The subject even engaged the attention of chemists and pharmaceutists of Europe, and several drugs were admitted as officinal in the pharmacopœias of other countries.

The holding of exhibitions has been the most important means in increasing our knowledge of indigenous drugs. I doubt if the amount of information which we possess at present about indigenous drugs could have been derived from any other source. The idea of

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* This paper was published under the title "Articles of *Materia Medica* obtained in the Bazars of India," in the first volume of the Bengal Asiatic Society's Journal.

exhibitions originated with the late Prince Albert, under whose auspices the first one was held in London in 1851. Dr. Royle was placed in charge of indigenous drugs, but I do not think the first exhibition, which was rather a trial, made any material addition to our knowledge of the subject. In the second International Exhibition in London of 1862, Dr. J. F. Watson was placed in charge of the indigenous drugs. For the first time, several indigenous drugs were brought to light.

In the interval between the first exhibition of 1851 and the second one of 1862, several exhibitions were held in different parts of this country. But I do not think they added anything to our knowledge of indigenous drugs.

The publication of the Pharmacopœia of India in 1867 under the authority of Her Majesty's Secretary of State for India marked an epoch in the history of the subject. To this day, that stands out as the authoritative work on the native remedies of this country. "With the view, firstly, of bringing to the notice of the profession in India those indigenous drugs which European experience has proved to possess value as medicinal agents, and which may be employed as efficient substitutes for imported articles; and, secondly, of remodelling the Bengal Pharmacopœia of 1844, Her Majesty's Secretary of State for India in Council was pleased to sanction the publication of a Pharmacopœia for India based upon the British Pharmacopœia, which, while affording all the information contained in that work of practical use in India, would embody and combine with it such supplementary matter of special value in that country as should adapt it to meet the requirements of the Indian Medical Department." *

The information that lay scattered among a large number of periodicals was brought together in this work and made accessible for reference to the medical officers serving in this country. Between the publication in Calcutta of the Bengal Pharmacopœia in 1844, and the issue of the Indian Pharmacopœia in 1868, that is during the period of twenty-four years, great advances were made in our knowledge regarding the medicinal properties and therapeutic uses of the indigenous drugs.

* Preface to the Indian Pharmacopœia, p. vi.

The establishment of Medical Colleges and schools in this country also advanced our knowledge of indigenous drugs. The graduates whom the colleges turned out directed their attention to the subject. They were not slow in recognising the importance of the study of indigenous drugs. There were other laborers also in the field. Dr. Waring, who edited the Indian Pharmacopœia so creditably, was one of the most painstaking and careful observes of the properties and uses of indigenous drugs. His attention was drawn to the subject when serving out in Burma. The stock of his European medicines having been exhausted, he was in great perplexity and hardly knew what to do. In such a crisis, he turned to the medicinal plants of the country. His extensive knowledge of Botany stood him in good stead greatly. He found indigenous drugs to answer his purposes as satisfactorily as the costly imported medicines of Europe. The series of papers under the title, "Notes on some of the principal Indigenous Tonics, Anthelmintics, &c., of India," published in the early volumes of the "Indian Annals of Medical Science," now defunct, shows the careful and painstaking manner in which he had studied the subject.

The use of the Pharmacopœia as a text book in the colleges and schools of this country, has also been productive of some good. The Pharmacopœia Committee was not wrong in imparting an educational character to their publication. The native remedies having been rendered familiar during the period of studentship, have been often made use of by Indian Medical Graduates.

Mention should also be made of the establishment of the Forest Department and the School of Forestry in this country as helping in increasing our knowledge of indigenous drugs. The forest officers have brought to light several plants used medicinally by the natives of this country. The late Dr. Stewart in his Punjab Plants, mentioned a large number of medicinal plants used by the rustics and villagers of the Punjab. Mr. Gamble and other forest officers have also noticed the medicinal plants of other parts of India. The increase in our knowledge of the properties and uses of the indigenous drugs by these means has not been inconsiderable.

The Calcutta International Exhibition of 1883-84 has done much

towards the study of indigenous drugs. Credit is due to Mr. T. N. Mukerjee and Sir George Watt, who spared no pains to make the Exhibition of indigenous drugs as complete as possible. The Dictionary of the Economic Products of India, originally projected by Mr. Mukherji, but subsequently completed by Dr. G. Watt, contains informations from all possible sources, as to the uses and properties of indigenous drugs.

IV.

"The only way to illumine the whole field of native therapeutics," wrote an intelligent foreigner, "is to survey it in small tracts and sift the value of those drugs peculiar to each province. .... There is a wide feeling that there is a beneficence in the scheme of nature which provides in every country suitable remedies on the spot for the ill to which humanity is locally most prone. Very little has been done so far to incorporate in the practice of physicians in the country the medicines which in India nature scatters broadcast from her lap."

It is necessary to pass in review the principal works which have advanced our knowledge of the subject. In order to do this, we should take into consideration those works which treat of the drugs of the different provinces of this country. In fact, excluding the "Pharmacopœia of India," the "Pharmacographica Indica" and Watt's "Dictionary of the Economic Products of India," all the works which have made their appearance deal with drugs and medicinal plants of certain provinces only. For obvious reasons this arrangement is a good one.*

I have already stated the great stimulus that was given to the study of the subject by the establishment of the Asiatic Society of Bengal. Calcutta which was once the Capital of India possessing one of the finest Botanical gardens in the world afforded great facilities for the study of the subject. Roxburgh, Fleming and Royle were the first to write about the medicinal plants and their uses in the Asiatic Researches and the Journal of the Bengal Asiatic Society.

* Of the drugs used by the ancient Hindus, the best account in English is the work on Hindu Materia Medica by the late Dr. Udoy Chand Dutt. This work requires re-editing.

But there was no systematic treatise on the indigenous drugs of Bengal till the publication of O'Shaughnessy's Bengal Dispensatory in 1842. Before the publication of this work, information concerning indigenous drugs was scattered in the journals and transactions of several learned societies, which were not easily accessible to all members of the medical profession. Mr. Louis DaCosta wrote in the Journal of the Bengal Asiatic Society for May, 1837, "it is a desideratum to know how the natives have treated the subject of medicaments—what of good their books contain—what of error. Our medical practice pays, perhaps, too little attention to vegetable remedies, of which the orientals possess an infinite variety, many inert but many active, and many also quite unknown to Europeans." The Bengal Dispensatory supplied a longfelt want on the subject. This was followed in 1844 by the Bengal Pharmacopœia. These two works form important landmarks in the literature of indigenous drugs. They were not free from errors. Even the author acknowledged that his multifarious duties prevented him from bestowing that amount of attention on the subject which its importance demanded. But considering the difficulties he had to contend with, the scanty materials which existed on the literature at his time, I think great credit is due to him for his works. He was one of the pioneers in this field of research. And it should not be forgotten that his Pharmacopœia of Bengal subsequently formed the groundwork of the Pharmacopœia of India.

The next work on the "Indigenous drugs of Bengal" is that of Kanay Lal Dey. That gentleman is a well-known authority on the subject. In 1862, for the International Exhibition held in London, he forwarded indigenous drugs chiefly of Bengal. The catalogue of drugs exhibited by him was subsequently published in book-form at the request of the Inspector-General of Civil Hospitals of Bengal. This work was a decided improvement on O'Shaughnessy's Pharmacopœia and Dispensatory.

No other work on the indigenous drugs of Bengal deserves any notice. Mr. T. N. Mukerji's "Catalogue of Amsterdam Exhibition" is a useful one, but it is principally compiled from the above sources.

There is no work treating of the indigenous drugs of Assam, Orissa, or of Behar (excepting Irvine's short account of the Materia

Medica of Patna, published in 1848). Notices of some of the medicinal plants and indigenous drugs of Assam and Orissa are to be found in the Gazetteer volumes of those provinces.

There have been a host of medical men to work out the medicinal plants and indigenous drugs of Madras. In the early days of the East India Company, Madras, the so-called benighted Presidency of to-day, attracted more scientific and medical men than any other part of India. It was on the Madras side that most of the illustrated works on Indian Botany were prepared. Rheede's "Hortus Malabarica," Roxburgh's "Coromandel Plants," Wight's "Icones," Beddome's "Flora Sylvatica" were all prepared by men who labored in that Presidency. Ainslie's "Materia Medica of Hindustan" published in 1813, and "Materia Indica" published in 1826, are still works of reference on the indigenous drugs of Madras. Waring was another authority on the Madras indigenous drugs. His labors have been embodied in the Pharmacopœia of India.

Bidie's "Paris Exhibition Catalogue of Raw Products of Southern India" is a useful publication on the indigenous drugs of Madras. In the Madras Quarterly and Monthly Journal of Medical Science, there are several papers from his pen on the subject of indigenous drugs.

Moodeen Sheriff will always occupy a prominent place amongst the workers on the subject of indigenous drugs. His Supplement to the Pharmacopœia of India established his reputation as a pharmaceutist of no mean order. His posthumous work on the "Materia Medica of Madras," has brought our information on some of the indigenous drugs of that Presidency up to date. It is unfortunate, however, that this work did not receive the last finishing touch of the author.

The indigenous drugs of Bombay, though neglected for a long time, have recently received proper attention. Dalzell and Gibson's "Bombay Flora," published in 1861, paved the way to the better study of the subject. Birdwood's "Vegetable Products of Bombay," published in 1862, was the first work that gave a systematic account of the Bombay drugs. In the Pharmacopœia of India published in 1867, the Bombay drugs were not adequately represented. But

since then, due principally to the labors of Sakharam Arjun and Dymock, the Bombay drugs have been far better worked out than those of any other part of India. Sakharam Arjun's "Bombay Drugs" was published in 1879. He was a skilled botanist, being the occupant of the Chair of Botany in the Grant Medical College. This publication was intended to serve as a catalogue of the Indian drugs in the Museum of the Royal Victoria Hospital at Netley. Dr. Sakharam Arjun succeeded in correctly identifying some of the bázár drugs and brought to the notice of the profession a good many medicinal plants used by the natives of Bombay.

Dymock's "Vegetable Materia Medica of Western India" is by far the best work on the indigenous drugs, not only of Bombay, but of India generally. It bears strong testimony to his having patiently worked at the subject for a large number of years. The *Pharmacographica Indica* will remain, for many years to come, the standard work of reference on indigenous drugs.

The medicinal plants and drugs of Sind have not yet been properly studied. The only work on the subject is that of Murray on "Plants and Drugs of Sind." Murray, neither being a medical man nor a skilled botanist, compiled his work from other sources and, as such, the work is of doubtful value as a guide to the plants and drugs of that province.

Our knowledge of the medicinal plants and drugs of the Punjab is also scant and meagre. Honnigberger's work named "Thirty-five years in the East" was the first one mentioning the Punjab medicinal plants and drugs. Honnigberger was a homœopathic practitioner and was physician to Ranjit Singh. The work is hardly of any value, and is very seldom referred to now-a-days.

The Punjab Exhibition of 1864 brought for the first time to light the drugs of that province. Mr. Baden Powell described the raw products in his well-known work on the Punjab products. Dr. Burton Brown, the late Principal of the Lahore Medical College, was the reporter on the drugs of the Punjab. As a chemist and a botanist Dr. Brown was well qualified to properly discharge his duties as a reporter. And up to this date, his report is the sole authentic guide to the drugs of that province.

Dr. Stewart, as Forest Officer, in his work on "Punjab Plants," noticed some of the medicinal plants of that province. He freely acknowledged the great help he derived from Dr. Brown in identifying many medicinal plants. Dr. Stewart's work is very valuable and, together with Dr. Brown's Report above referred to, is the only work mentioning some of the medicinal plants of the Punjab.

Of the medicinal plants and drugs of the United Provinces of Agra and Oudh we know very little. Mr. Atkinson's work on the "Economic Products of the North-West Provinces" is the only work treating of the drugs of those provinces.

The medicinal plants and drugs of the Central Provinces and Rajputana have not been properly worked out. It is highly desirable that these provinces should receive, at the hands of botanists and medical men, that amount of attention which they deserve.

Thus it will be seen that, although there are many works on the medicinal plants and drugs of different provinces of India, yet a great deal remains to be done for the drugs and medicinal plants of Cashmere, Beluchistan, Sind, Punjab, United Provinces of Agra and Oudh, Behar, Orissa, Assam, Central Provinces and Rajputana. Owing to the publication of the *Pharmacographica Indica* and Watt's "Dictionary of the Economic Products of India," there is not the same difficulty now to work out the subject which the early laborers in this field of research experienced. For, not only the **Flora of British India** projected by Hooker has been completed, but Floras of most of the provinces of India have been in recent years prepared by some of the noted Indian botanists. Thus the *Bengal Plants* by Sir David Prain, the *Gangetic Flora* describing plants of the United Provinces of Agra & Oudh by Mr. J. F. Duthie, *Flora of Bombay* by Dr. Theodore Cooke, *Flora of the Central Provinces* by Mr. Haines, *Fora of Madras* by Mr. Gamble, *Punjab Plants* by Colonel Bamber, *Flora Simlensis* by the late General Collett, *Plants of Baluchistan* by Mr. Burkill, and *Flora of Assam* under preparation by Rai Bahadur Upendra Nath Kanjilal, will be of great help to those who are interested in the study of the medicinal plants of this country. Of the **Native States of India,** the plants of *Kashmir* were worked out principally by Jacquemont and Royle; of *Nepal* by Wallich and recently by Mr.

J. H. Burkill; of *Bhotan and Sikkim* recently by Messrs. Burkill and Smith; of *Cutch* by Revd. Father Blatter; of *Mysore* in the Gazetteer Volume of that principality; and of *Baroda and Kathiawad* States by Mr. Jayakrishna Indrajit in Guzerati.

V.

The outlook is not so gloomy now as it was more than twenty-five years ago, when I commenced the study of the subject. The Petit Laboratory established in Bombay was almost the first institution intended to work out the pharmacology of Indian drugs. For this purpose, the late Dr. K. N. Bahadurji was appointed to its charge.

The Indian Medical Congress held in Calcutta in 1894 recorded the following resolution:—

"That it be recommended to the consideration of the Government of India that an extended use of indigenous drugs is most desirable."

It was on this resolution that the Government of India appointed the Indigenous Drugs Committee which held their first meeting in Calcutta, on January 3rd, 1896. In appointing this Committee, it was stated,

The points to which the Government of India desire more particularly to invite the attention of the Committee, with a view to their careful consideration, are the practicability, as well as the utility, of—

(*a*) encouraging the systematic cultivation of medical plants indigenous to India;

(*b*) encouraging the increased use in Medical Depôts of drugs of known therapeutic value; and

(*c*) sanctioning the manufacture of stable preparations of certain drugs at the Depôts.

Regarding the above the Government of India desire that the Committee should further consider, and report their opinion as to the action which would be best calculated to give the suggested encouragement. The Committee should further consider, from a practical point of view, the question of initiating, as a Government measure, experiments to test the *reputed* therapeutic value of indigenous drugs. The Government of India, as at present advised, are inclined to the opinion that such investigations can more profitably be left to the enterprise of private individuals.

This Committee has so far published two useful reports.

The Ayurvedic practitioners are holding conferences every year in different cities of this country, in which medicinal plants and drugs are exhibited. This will greatly advance the cause of the more extensive use of indigenous drugs. The chemistry of Indian medicinal plants is being investigated by several chemists in different laboratories of India, as is evident from their reports published from time to time in journals of Chemical Societies and of other learned institutions. The quarterly journal, named "Food and Drugs," of Calcutta, now defunct, published several interesting papers on indigenous drugs. There are also a few workers in Tata's Research Institute, Bangalore, investigating this subject. Fifty thousand rupees have been donated to the Tropical School of Medicine recently established in Calcutta, by His Highness the Maharaja of Durbhanga, and earmarked for the investigation of the properties and uses of indigenous drugs.

But at present there is no Pharmaceutical Society or School of Pharmacy in this country to carefully study and investigate the subject of indigenous drugs. The establishment of such an institution is highly desirable; so also of farms of medicinal plants. Regarding the growing of medicinal plants, Mr. F. A. Miller writes in the Journal "American Pharmaceutical Association III, pp. 34-38" that the time has arrived to reduce the work of drug cultivation to an exact science and to determine the commercial possibilities of the most promising forms, in the same manner as has been done in agricultural and other economic farms." *

The 1914-1918 war, as mentioned before, emphasised the necessity of extensively growing medicinal plants especially in India where, with little difficulty, economic plants of all lands can be cultivated.†

The establishment of medicinal farms in well selected localities †

* [Chemical Abstracts for February 20th, 1914, p. 786.]

Mr. R. P. Crawford writing in Scientific American Supplement, September 8, 1917 on "Reducing drug plant cultivation to a science," says, "that drug plant cultivation is far from easy and the institution that works out these problems in connection with several score different plants has a difficult task ahead, but one which may pave the way toward American independence in drug science."

Scientific cultivation of drug plants in this country will make India independent in drug science.

† Lieutenant-Colonel Sir Leonard Rogers, M.D., F.R.C.P., K.C.I.E., I.M.S., the founder of the Calcutta Tropical School of Medicine is reported to have said before the Indian Industry Commission, that "most of the drugs imported into India were absolute refuse,

will exercise scientific control over the cultivation of medicinal herbs and plants. Regarding the advantages of conducting a farm of this nature Messrs. Burroughs Wellcome and Co., who have established such a one, write:—

"1. A drug may be treated or worked up immediately it has been collected.

"2. Herbs may be dried, if necessary, directly they are cut, before fermentation and other deteriorative changes have set in.

"3. Freedom is ensured from caprice on the part of collectors, who, in gathering wild herbs, are very difficult to control in the matter of adulteration, both accidental and intentional.

"4. Opportunity is provided to select and cultivate that particular strain of a plant which has been found by chemical and physiological tests to be the most active, and which gives the most satisfactory preparations."

We know there are many plants mentioned by Hindu medical authors which are not procurable now. We have to refer to such names as those of Kâkolî, Ksira kâkolî, Medhâ, Mahâ Medhâ, Jîvaka, Risabha, &c. Perhaps this extinction of valuable medicinal plants of ancient India is well explained by what Mr. J. L. Stingel writes in the *American Journal of Pharmacy* for 1912 (pp. 299 *et seq*) regarding Hydrastis that with the progress of civilisation the plant has diminished. He says that "the scarcity of this valuable drug cannot be entirely attributed to lack of plants or to extinction, but to other conditions, which tend to prevent identification at the time of collection." This shows also the necessity of rational cultivation, and hence of medicinal farms.*

Many have been disappointed from the use of indigenous drugs for which the cause is not far to seek. A writer in the *Calcutta Review* for 1869 (p. 199) said:—

"The distrust of bazar medicines is, we are convinced, well warranted by facts. In many cases bazar medicines are simple trash.

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and considering that one-half of the drugs in the British pharmacopœia are indigenous to India and that most of the rest could be cultivated there is clearly an opportunity of developing an industry that has been almost neglected, and if India is to grow its own drugs it must take care that it gets them unadulterated."

* A few enterprising Ayurvedic practitioners of Calcutta have established such farms in the neighbourhood of that city. But these are on small scale.

Let any one only look at the system of storage followed in a *pansari's* shop, and *one* very evident reason of this will be apparent. His wares are of all degrees of staleness, the stock of many of them inherited from his father or grandfather and long ago inert. Stoppered bottles are things unknown, and all substances are alike stowed in bags or earthen vessels, exposed to every variation of the atmosphere in respect of heat and moisture, and to the attack of every kind of insect. * * * Many are adulterated, and as a matter of course, none are labelled."

The above also shows the necessity of medicinal farms and the establishment of depots for the supply of reliable preparations of indigenous drugs.

It is the bounden duty of educated Indians to do all that lies in their power for the proper study of Indian medicinal plants and drugs. In 1879, the *Calcutta Review* wrote:—

"The resuscitation of Indian medical science is a noble and useful work which ought to be performed by educated Hindoos. * * * It is perfectly true that Indian drugs ought to be largely studied and used by medical practitioners in this country. European medical men fully admit this truth and some of them have labored earnestly and assiduously to accomplish this object. But it is easy to understand that the efforts of foreigners must be necessarily imperfect and unproductive of adequate results. Upon educated Indian members of the profession, therefore, devolves this great and solemn duty, for it is they alone who can discharge it adequately and well. * * In India the foreign and the indigenous systems ought to be read together if full benefit is to be derived from either."

B. D. BASU.

Scientific name.	Native name.	Use.
	DRY MEDICINES.	
Prunella sp—,	Ustúk húdús	Aromatic.
Raw Silk	Abresham	Inert.
Centaurea Behmen	Báhman	Tonic.
Polypodium	Bisfaij	Tonic.
Dracocephalum Roylea-	Bálangú	Aromatic.
num	Bábchí	Tonic.
Psoralea corallifolia	Dárchíni	Aromatic.
Laurus cinnamomum	Taj	Aromatic.
Laurus cassia	Shakákul	Demulcent.
Pastinaca	Zafrán	Inert.
Crocus sativus	Pudína	Aromatic.
Mentha sativa	Jaiphal	Aromatic.
Myristica moschata		
	MOIST REMEDIES.	
Phyllanthus emblica	Amla	Astringent.
Tamarindus indica	Imlî	Purgative.
Silica	Tabáshîr	Inert.
Vitis vinifera	Zirishk	Demulcent.
Camphora	Káfúr	Aromatic.
Onosma sp—,	Gauzabán	Tonic.
Coriandrum sativum	Dhanyáñ	Aromatic.
Rosa	Gul súrkh	Astringent.
Nymphœa	Nílofar	Inert.
Citrus aurantium	Narangi	Aromatic.

From the above list it will be seen that many of the cold remedies, are what are used in European therapeutics astringent medicines, while the hot remedies are principally aromatics; but that very various remedies are classed under the terms moist and dry."

LIST OF WORKS CONSULTED

I.

Charaka	Charaka-samhita.
Sushruta	Sushruta-samhita.
Vagbhata	Ashtanga-hridaya.
,,	Ashtanga-sangraha.
Vrinda-madhava	Siddha-yoga.
Sharangdhar (1363)	Sharangdhar-samhita.
Nityanatha	Rasa-ratnakara.
Anantadeva	Rasachintamani.
Bhavmishra	Bhava-prakasha.
Lolimbaraja (1608)	Vaidya-jivan.
———— (1676)	Yoga-ratnakara.
Dhanvantari	Dhanvantari-nighantu.
Kashiraja	Raja-nighantu.
Madanpala	Nighantu.
Madhava Upadhyaya (1730)	Ayurveda-prakasha.
Shankarnama	Vaidyavinoda.
Datar, Tamankar, Mahabal, Patel, and Gokhale (1867)	Nighanta-ratnakara.
Vasudeoshastri C. Bapat (1882)	Vanaushadhi-prakasha.
Chaube Dattaram (1896)	Brihan-nighanta-ratnakara.
Shaligrama (1896)	Shaligrama-nighantu.
Kayyadeva	Nighantu.
Shankarshastri Pade (1924)	Subodhavaidyaka.
Baladeva Mishra	Ayurveda-chintamani.
Govindadas Sen.	Bhaishajya-ratnavali.
Ravana	Arka-prakasha.
Chakrapani	Chakradatta.
Dattarama Chaube	Brihadrasarajasundaram.
Gopala Krishna Bhattasuri	Rasendrasarasangraha.
Atreya	Harita-samhita.

II.

Ikhtiyarate-badia.
Jamaac-betar.
Alfazul-adviyah.

Makhzanul-adviyah.
Muntakhabul-adviyah.
Quarabadine-sikandari.
Tohfatul-mominin.
Makhazane-mufaredat.
Murakebate-khavasul-adviyah.
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INDIAN MEDICINAL PLANTS

PHANEROGAMIA.

RANUNCULACEAE.

Annual or perennial herbs or rarely shrubs. Leaves radical or alternate, rarely opposite. Flowers bisexual or unisexual, regular or irregular. Sepals 5 or more, rarely fewer, very rarely persistent, often petaloid, imbricate or rarely valvate. Petals 5 or more or 0, rarely 4 or 3, hypogynous, imbricate, often minute or deformed. Stamens hypogynous, usually numerous in many rows. Anthers adnate, opening laterally or outwards. Carpels numerous, rarely 1, free or rarely coherent; stigma simple; ovules numerous or solitary, on the ventral suture. Fruit of one-seeded beaked or plumose achenes or many-seeded follicles or rarely a capsule or berry.—Genera 40. Species 700.—Mostly N. temperate.

A. Erect or climbing shrubs. Leaves opposite. Sepals petaloid, valvate. Carpels 1-ovuled; ovule pendulous. Fruit of many achenes
Petals 0 .... CLEMATIS.

B. Herbs. Leaves radical or alternate. Sepals petaloid, imbricate. Carpels 1-ovuled; ovule pendulous. Fruit of many achenes
I. Petals 0. Flowers involucrate .... ANEMONE.
II. Petals 0. Flowers not involucrate .... THALICTRUM.
III. Petals 5-16, with no nectariferous pit .... ADONIS.

C. Herbs. Leaves radical or alternate. Sepals herbaceous, imbricate. Carpels 1-ovuled; ovules erect. Fruit of many achenes
Sepals 3-5, deciduous. Petals usually 5 .... RANUNCULUS.

D. Herbs or undershrubs. Leaves alternate. Sepals petaloid or herbaceous, imbricate. Carpels several, many-ovuled. Fruit of 1 or more follicles (berried in Actæa)
I. Flowers regular solitary or panicled
a. Petals 0. Leaves undivided .... CALTHA.
b. Petals small, carpels long-stalked .... COPTIS.
c. Petals small, unguiculate. Carpels sessile. Flowers pale blue .... NIGELLA.

II. Flowers regular, racemed
  a. Carpels solitary, berried when ripe .... ACTÆA.
  b. Carpels 4-8, follicular when ripe .... CIMICIFUGA.
III. Flowers irregular
  a. Posterior sepal spurred .... DELPHINIUM.
  b. Posterior sepal vaulted .... ACONITUM.
E. Herbs or undershrubs. Sepals herbaceous imbricate. Carpels several, several-ovuled, girt by a fleshy disk. Fruit of coriaceous few-seeded follicles .... PÆONIA.

Poisonous, acrid, vesicant, purgative, and narcotic properties prevail in varying degree throughout the Order.

Most species lose their acrid property on drying or on boiling with water.

The various members which have been chemically examined have been found to contain (1) alkaloids—aconitine, ajacine, ajaconine, atisine, benzaconine, berberine, bikhaconitine, canadine, clematine, coptine, cynoctodine, damascenine, delphinine, delphinoidine, delphisine, hydrastine, indaconitine, isopyrine, japaconitine, jervine, jesaconitine, lappaconitine, lycaconitine, myoctonine, neopelline, palmatisine, pseudaconitine, septentrionaline, staphisagroine—; (2) volatile acrid and bitter principles—anemonin, cimicifugin, nigellin—; (3) acids—aconitic anemonic, isoferulic, valerianic—; (4) crystalline or amorphous glucosides—adonidin, delphinin, helleborein, helleborin, paeonin—; (5) saponins, tannins, resins, oleoresins, sugares, and fats.

OFFICIAL:—Aconitine (France, Italy, Portugal, Spain, United States); aconitine nitrate (France).

Hydrastine (France); hydrastine hydrochloride (Spain).

Aconitum Napellus Linn. (Belgium, France, Great Britain, Holland, Italy, Japan, Portugal, Russia, Spain, Sweden, Switzerland, United States).

Adonis vernalis Linn. (Austria, Holland, Italy, Spain, Switzerland), *A. appenina* Jacq. (Russia).

Anemone nemorosa Linn. (portugal); *A. pulsatilla* Linn. (France)—*Pulsatilla vulgaris* Mill. (Portugal).

Cimicifuga racemosa (L.) Nuttall (United States).

Coptis spp. (Japan).

Delphinium consolida Linn. (Portugal); *D. staphisagria* Linn. (France, Holland, Portugal).

Helleborus faetidus Linn., *H. niger* Linn., *H. officinalis* Sib. (Portugal).

Hydrastis canadensis Linn. (Austria, Belgium, Denmark, France, Germany, Holland, Hungary, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States).

CLEMATIS Dill. ex Linn.

Climbing shrubs. Leaves opposite, simple or compound, exstipulate, petioles often twining. Flowers solitary or fascicled or panicled, axillary or terminal. Sepals usually 4, petaloid, valvate. Petals 0. Stamens many. Carpels numerous, distinct, with one pendulous ovule in each. Fruit a head of sessile or stalked achenes with long, usually feathery styles.—Species 220.—Cosmopolitan.

A. Achenes with long feathery styles. Flowers in axillary fascicles; pedicels 1-flowered .... 1. *C. napaulensis.*
B. Achenes with long feathery tails. Flowers in axillary panicles
  I. Filaments glabrous, connective of anthers not produced
    a. Glabrous .... 3. *C. smilacifolia.*
    b. Silky .... 2. *C. triloba.*
    c. Young parts pubescent .... 4. *C. gouriana.*
  II. Filaments hairy, connective of anther not produced .. 5. *C. graveolens.*

This genus is acrid and poisonous; the leaves and fresh stems, if bruised and applied to the skin, cause vesication; in some species the seeds have purging properties.

The following species are used medicinally in Europe—*C. alpina* Mill., *C. flammula* Linn., *C. integrifolia* Linn., *C. recta* Linn., *C. vitalba* Linn., *C. viticella* Linn.—; in Indo China—*C. apiifolia* DC., *C. chinensis* Retz., *C. dioica* Linn., *C. florida* Thunb., *C. paniculata* Thunb., *C. patens* Morr. and Dec., *C. smilacifolia* Wall., *C. virginiana* Linn., *C., vitalba* Linn.—; in China—*C. apiifolia* DC., C. *chinensis* Retz., *C. paniculata* Thunb., *C. recta* Linn.—; in North America—*C. crispa* Linn., *C. ligusticifolia* Nutt., *C. viorna* Linn., *C. virginiana* Linn.—; in Jamaica—*C. dioica* Linn.—; in Guinea—*C. grandiflora* DC., *C. thunbergii* Steud.—; in the islands of Mauritius and La Reunion—*C. mauritiana* Linn.—; in Madagascar—*C. bojeri* Hook., *C.*

mauritiana Lam., *C. saxicola* Bojer and Hills—; in Southern Africa —*C. brachiata* Thunb., *C. stewartiae* Burtt-Davy—.

1. **Clematis napaulensis** DC., Syst. 1 (1818) 164—*C. montana* D. Don Prodr. Fl. Nep (1825) 192 (non Ham.).—PLATE 1.

An evergreen climber with spreading stems often forming dense masses and attaining 12m. high and 20mm. diam. Bark pale brown, rough, exfoliating in loose fibrous strips. Leaves mostly fascicled on arrested branches, trifoliate. Petiole usually 2.5—5 cm., long, sometimes less. Leaflets variable, 3.8—12.7 by .7—3cm. entire or more or less deeply 3-lobed, sometimes to the base, very membranous, usually lanceolate or linear-lanceolate, acute, glabrous, glossy beneath. Flowers greenish, on axillary fascicled slender drooping peduncles 2.5—6.3 cm. long. Sepals 15—18 mm. long, erect, densely silky-pubescent outside. Filaments glabrous, pink. Anthers lilac. Peduncles with two connate membranous green bracts forming a cup about 6 mm. below the flower (12-20 mm. below the fruit), sometimes enlarged and foliaceous. Achenes hairy; styles exceeding 2.5 cm.

Distribution: Temperate Himalaya from Garhwal to Bhutan. In Kumaon throughout between 4,500 and 7,000 ft., usually found in shady moist ravines (Osmaston).

In Kanwara leaves are said to act deleteriously on the skin (Stewart).

Kumaon: Ghantiali, Jai, Kanguli—; *Punjab:* Birri, Pawanne, Wandak.

2. **Clematis triloba** Heyne in Roth Nov. Sp. (1821) 251.—PLATE 2.

An extensive climber, but often found trailing amongst grass; whole plant except the older stems sericeo-villous or tomentose; stems sulcate. Leaves simple or once ternate, entire or shallowly 1-7—lobed, the lobes usually mucronate; blades 2.5—5 cm. long, from ovate, acute, to orbicular, base rounded, cuneate or cordate; petioles slender, twining, 2—7.5 cm. long; petiolules 6—20 mm. long. Flowers white, more than 3.8 cm. across, in axillary, corymbose panicles; bracts foliaceous, ovate, acute. Sepals 4—6, stellately spreading, pubescent outside, glabrous inside, oblong or obovate, terminated by a tomentose mucro. Stamens 6—9 mm. long; filaments ligulate,

glabrous; connective not produced. Achenes ovoid, compressed, silky-villous, with long feathery tails.

Distribution: Bombay Presidency; Konkan and Deccan, W. Ghats.

Sweet, bitter, astringent, hot, stimulant, laxative; stimulates secretion of the bile; secreted by the skin which is stimulated during the process, hence used in leprosy, blood diseases, and fever; also used internally in thirst, heart troubles, and bilious vomiting; externally applied to boils, itch, and to kill parasitic worms (Ayurveda).

Prescribed in combination with other drugs for the treatment of snake-bite (Sushruta, Sharngdhar-samhita).

Every part of the plant is equally useless in the antidotal treatment of snake-bite (Mhaskar and Caius).

Bombay: Moravela, Moriel, Morvel, Ranjae, Ranjai—; *Canarese:* Morhari—; *Gujerati:* Morvel—; *Hindi:* Churahar, Dhantiali, Murhari—; *Marathi:* Moravela, Morbel, Ranjani—; *Porebunder:* Trekhdovelo—; *Sanskrit:* Murva, Devashreni, Devi, Dhanurmala, Dhanurguna, Dridhasutrika, Gokarni, Laghuparnika, Madhulika, Madhurasa, Madhushreni, Madhusrava, Morata, Piluparni, Prithakaparni, Snigdhaparni, Snuva, Tejani—; *Sind:* Maruva—.

3. **Clematis smilacifolia** Wall. in Asiat. Res. 13 (1820) 402; Bot. Mag. t. 4259; Wight Ic. t. 1.—*C. Munroana* Wight Ill. I (1840) 5, t. 1.

C. subpeltata Wall. given as a synonym in Hook. f. Fl. Brit. Ind. I, 3 is a different species occurring in Burma, Yunan, Laos and Siam.

A woody climber, glabrous except the inflorescence; stems sulcate. Lower leaves 7.5—20 by 2.5—15 cm., ovate, acute or acuminate, entire or shortly serrate, base rounded or cordate, 5—9—(frequently 7—) nerved from the base; petioles reaching 15 cm. long, twining. Upper leaves sometimes once ternate; blades smaller, narrower, cuneate at the base. Flowers large, exceeding 2.5 cm. in diam., in long, axillary panicles; pedicels reaching 7.5 cm. long, glabrous. Sepals 4-5, oblong, 19-25 mm. long, spreading from the base, at length reflexed, clothed outside with

velvety brown tomentum, purple inside. Filaments linear, glabrous, the outer longer than the inner with shorter anthers; connective produced. Achenes ovoid, compressed, pubescent with thickened margins and long feathery tails.

Distribution: Kumaon, Himalaya from Sikkim eastwards up to 5,000 ft., Assam, Ganjam, Konkan, Kanara and Deccan of Bombay Presidency.—Java, Borneo, Philippines.

In Indo-China a decoction of the roots is used against courbature.

Canarese: Hottuhambu—; *Indo China:* Day ong lao, Khoua kau san, Linh tien—; *Malayalam:* Vatiyampu—; *Sinhalese:* Narawel—; *Telugu:* Gurraputige—.

4. **Clematis gouriana** Roxb. Hort. Beng. (1814) 43; Wight Ic. t. 933, 934.—PLATES 3 AND 3A.

Climbing to a great height, usually glabrous, except the young parts; stems grooved, brown. Leaves pinnate, bipinnate or tripinnate; leaflets 2.5—13 by 1.2—3.7 cm., ovate or oblong, acuminate, entire or coarsely toothed, rounded or cordate at the base, strongly nerved and reticulately veined, upper surfacee shining; petioles long, slender. Flowers small, scarcely reaching 12 mm. in diam., in much-branched, decompound panicles, yellowish or greenish white; peduncles and pedicels more or less pubescent. Sepals 4, obovate or oblong, puberulous on both surfaces. Filaments narrow-linear, glabrous; connective not produced. Achenes ovoid, hairy, with long feathery tails.

Distribution: Punjab Hills, W. Himalaya up to 5,000 ft., hilly districts throughout India between 1,000 and 3,000 ft., Ceylon.—Java, Philippines.

The leaves of the fresh stems, if bruised and applied to the skin, cause vesication.

Bombay: Moriel, Morvel, Ranjai—; *Canarese:* Telejadari—; *Dehra Dun:* Belkangu, Belkum—; *English:* Indian Traveller's Joy—; *North-Western Provinces:* Belkangau, Belkun—; *Saora:* Pannedang, Pedutivva—; *Uran:* Golarang—; *Uriya:* Boromojhanti, Idiya—; *Visayan:* Calupad, Tolangsangbanug—.

5. **Clematis graveolens** Lindl. in Journ. Hort. Soc. 1 (1846) 307.

A slender climber, devoid of hairs except the flowers. Leaves cut into numerous compound pinnae. Leaflets 12—25 mm. long, toothed or cut more deeply or 3-lobed or cut down to near the base, last segment oblong, pointed or blunt. Flowers forming 3—7—flowered panicles, upper flowers often solitary, 3.8—5 cm. diam., pale yellow, with a heavy scent. Sepals hairy outside, densely tomentose inside. Filaments narrow-linear, hairy. Achenes hairy.

The very compound leaf distinguishes this species at once.

Distribution: W. temperate Himalaya to Kumaon, 6,000—11,000 ft., Baluchistan.

In Baluchistan, the plant is considered poisonous (Hughes-Buller).

Baluchistan: Hushokawal.

ANEMONE Linn.

Perennial herbs. Stems erect, usually branched. Leaves radical, long-stalked, deeply lobed, margins toothed. Flowers rather large, regular, in a simple or compound, umbelliform cyme bearing leaf-like involucres at its base and at the forks of its branches; cymes few or many-flowered. Sepals 5—8, petal-like, imbricate, spreading. Petals none. Stamens numerous. Carpels many, 1-ovuled, styles short. Fruit a head of sessile achenes. Species 100. Cosmopolitan.

The leaves are acrid and irritating, and cause blistering if applied while fresh to the skin; the roots are generally purgative.

The following species are used medicinally:—in Europe—*A. alpina* Linn., *A. coronaria* Linn., *A. narcissiflora* Linn., *A. nemorosa* Linn., *A. pratensis* Linn., *A. pulsatilla* Linn., *A. ranunculoides* Linn., *A. stellata* Lam., *A. sylvestris* Linn., *A. trifolia* Linn., *A. vernalis* Linn.—; in Japan and China—*A. cernua* Thunb.—; in Indo China—*A. cernua* Thunb., *A. dichotoma* Linn., *A. hepatica* Gorth., *A. japonica* Sieb. and Zucc., *A. nikoensis* Max.—; in North America—*A. nemorosa* Linn., *A. parviflora* Mich., *A. patens* Linn.—; in Southern Africa—*A. caffra* Harv., *A. transvaalensis* (Szysz.) Prantl—.

In Siberia, the juice of *A. altaica* Fisch., *A. narcissiflora* Linn., *A. parviflora* Mich., *A. ranunculoides* Linn., *A. reflexa* Steph. is used to poison arrows.

Anemonin, or anemon camphor, has been obtained from *A. nemorosa, A. pratensis, A. pulsatilla,* and *A. transvaalensis.*

OFFICIAL:—Leaves and flowers of *A. nemorosa* Linn. (Portugal), and *A. pulsatilla* Linn. (France, Portugal).

1. **Anemone obtusiloba** D. Don. Prodr. Fl. Nep. (1825) 194 (non Lindley); Coventry Wild Fl. Kashmir (1923) 5, pl. III; Blatter Beautiful Fl. Kashmir I (1927) 6, pl. 1, fig. 5, 6, 7.—*A. discolor* Royle Ill. 52, t. 11, f. 1.

Rootstock woody, fibrous, clothed with old leaf-sheaths. Flowering stems 15—30 cm. tufted, hairy, sometimes branched. Leaves many, stalked, arising from the rootstock, round or almost round in outline, deeply heart-shaped, 3-parted, 5—7.5 cm. diam., softly hairy on both surfaces, lobes variously cut and lobed, broad, not stalked. Involucral leaves about 2.5 cm. long, 3-lobed, not stalked. Flowers 1—3 on one stem, 19—50 mm. diam., white, the lower portion outside usually tinged with blue-purple or lead colour, often blue or deep blue, or, at higher altitudes, yellow; flower-stalks long, slender. Sepals usually 5, sometimes more, silky outside, petal-like. Petals O. Stamens many. Fruit a head of many achenes which are tipped by a short style and not imbedded in wool, but coarsely hairy.

Distribution: Temperate and alpine Himalaya from Kashmir to Sikkim 8,000 to 15,000 ft.

Leaves and bark; hot, dry, bitter; not good for headache; emmenagogue; good in complaints of spleen and kidney; remove jaundice; taken with wine as an antidote in snake-bite; good for sores in the mouth (Yunani).

In Hazara the pounded root, which is acrid, is mixed with milk and given internally for contusions. In Bessahir it is said to be used as a blister, but to be apt to produce sores and scars (Stewart).

The seeds, if given internally, produce vomitting and purging. The oil extracted from them is used in rheumatism.

Jauntar: Ageli—; *Kumaon:* Kakriya, Ratanjota, Rattanjog—; *Punjab:* Padar, Ratanjota, Rattanjog—;

THALICTRUM Tourn ex Linn.

Perennial, glabrous herbs. Stems erect, rarely partially decumbent, branched. Leaves alternate, base of stalk sheathing, pinnate or 2-pinnate, some or all of the pinnules with 3 leaflets; leaflets stalked, orbicular or ovate, more or less distinctly 3-lobed, crenate or bluntly toothed, the crenatures often with a minute point, rarely entire, lower surface paler than the upper. Flowers small, regular, often polygamous, in panicles; floral leaves alternate, not involucrate. Sepals 4—5, imbricate, petal-like, soon falling off. Petals none. Stamens numerous, sometimes coloured and projecting beyond the calyx. Carpels several or many, sessile or shortly stalked, 1-ovuled, style short. Fruit a small head of usually ribbed and more or less flattened, rarely terete, achenes; style persistent curved or nearly straight, tip hooked.—Species about 80.— N. hemisphere.

The root is diuretic and purgative.

The following are used medicinally:—in Europe—*T. angustifolium* Linn., *T. aquilegifolium* Linn., *T. flavum* Linn.—; in Indo China—*T. aquilegifolium* Linn., *T. flavum* Linn., *T. foliolosum* DC.—; in Southern Africa—*T. minus* Linn.—.

1. **Thalictrum foliolosum** DC. Syst. I (1818) 175.—PLATE 4.

A tall perennial rigid herb. Stem 1.2—2.4 m., glabrous. Leaves exstipulate, pinnately decompound; petiole-sheaths auricled. Leaflets 4-6 mm., rarely 25 mm., orbicular. Panicles much-branched, bracts small. Flowers polygamous, white, pale green, dingy purple. Sepals 4-5. Petals 0. Stamens many, filaments filiform; anthers beaked. Ovule 1, pendulous. Achenes usually 2-5, small, oblong, acute at both ends, sharply ribbed.

Distribution: Throughout the Himalaya, 5,000—8,000 ft., Khasia Hils, 4,000—6,000 ft., Burma.—Siam.

A kind of turmeric; bitter and pungent; tonic with a slight purgative action; clears the brain; used as a collyrium in ophthal-

mia, improves eye-sight; good in toothache, in acute diarrhœa; a good application in piles, nail troubles, and discolouration of the skin (Yunani).

The root combines tonic and aperient properties, and has been found useful in convalescence after acute diseases, in mild forms of intermittent fevers, and in atonic dyspepsia.

The root is largely used as an *anjan*, or application for ophthalmia in Afghanistan and throughout India.

In the Punjab, the root is used as a purgative and diuretic (Baden Powell).

Arabic: Mamiranchini—; *Bengal:* Gurbiani—; *Bombay:* Mamiran—; *Hindi:* Mamira, Pilijari, Pinjari, Shuprak—; *Kashmir:* Chaitra—; *Kumaon:* Barmat, Penglajari, Pilajari—; *Persian:* Mamiranchini—; *Punjab:* Chireta, Chitramul, Gurbiani, Keraita, Mamira, Pashmaran, Phalijari—.

ADONIS Linn.

Annual or perennial herbs. Leaves much divided. Sepals 5—8, petaloid, coloured, imbricate. Petals 5-16, yellow or red, eglandular. Carpels many; style short; ovule 1, pendulous. Fruit a spike or head of many achenes tipped with a short persistent style.—Species 10.—N. Palaeotemperate.

The genus exhibits diuretic and laxative properties.

A. æstivalis Linn., *A. autumnalis* Linn., *A. cupanianus* Guss., *A. vernalis* Linn. are used medicinally in Europe.

OFFICIAL:—The herb of *A. vernalis* Linn. (Austria, Holland, Italy, Spain, Switzerland)—*A. appenina* Jacq. (Russia).

1. **Adonis œstivalis** Linn., Pl. ed. II, 771.

An erect annual herb. Stem 30-60 cm., high leafy, simple or branched. Leaves alternate, stalkless, pinnately divided into thread-like segments. Flowers scarlet or golden-yellow with a dark purple eye, about 13 mm. diam., solitary at the end of branches. Sepals 5, green or slightly coloured, soon falling off. Petals 5-8, rather larger than sepals. Stamens many. Fruit an ovate or oblong head of many small pitted achenes tipped with the persistent styles. The head becomes longer as the fruit ripens.

Distribution: Temperate Europe and Asia, W. Himalaya, from Peshawar to Hazara and Kumaon.

The whole plant is used as a cardiotonic and diuretic in Europe. The flowers are considered laxative, diuretic, and lithothriptic.

Catalan: Ull de perdiu—; *French:* Adonide d'été, Rougeotte—; *German:* Feuerroeschen—; *Languedoc:* Rubissa—; *Reggio:* Pe d'esen—; *Romagna:* Chiga sanev, Erba corta, Fior d'Adone, Gattapozzia—; *Russian:* Goritzvyet Krasnee—; *Sardinia:* Ogu de boi—; *Spanish:* Ojo de perdiz—; *Treviso:* Gioze de sanguse, Stiantamalanni—.

NIGELLA (Tourn.) Linn.

Annual herbs. Leaves 1-3-pinnately dissected into linear or capillary lobes. Flowers bluish. Petals small, clawed, with bilabiate lamina, the outer lip cleft into two or more lobes, the inner smaller, entire or bifid. Nectar-pore at base of outer lip. Fruit composed of 5-12 more or less united follicles. Styles long, beak-like.—Species 16.—Mediterranean.—1 species cultivated and run wild in India.

The aromatic seeds are reputed to be emmenagogue, diuretic, and galactagogue.

The following are used medicinally in Europe—*N. arvensis* Linn., *N. damascena* Linn., *N. hispanica* Linn., *N. sativa* Linn.—; in Syria—*N. orientalis* Linn.—; in Malaya—*N. sativa* Linn.—.

1. **Nigella sativa** Linn., Sp. Pl. (1753) 753; Brand Monogr. Nigella 36; Haines Bot. Bih. & Or. (1921), 5.—*N. indica* Roxb. ex Flem. in As. Res. XI (1810) 173.

A pretty herb, 30-60 cm. high. Leaves 2-3-pinnatisect, 2.5—5 cm. long, cut into linear or linear-lanceolate segments. Flowers pale blue on solitary long peduncles, 2—2.5 cm. across. Sepals ovate, acute, clawed. Nectarial petals 8, geniculate, with a saccate gland in the knee, one on the face and one on the apex of each lobe. Carpels 5-7, inflated, warty at the sides, united to the top; beak as long as the ovary. Seeds trigonous, rugulose-tubercular.

Distribution: Punjab, Bihar, sometimes cultivated and an occasional weed of cultivation.

Bitter, with a sharp taste, aromatic, appetiser, stimulant, emmenagogue, carminative, anthelmintic; an adjunct to purgative remedies (Ayurveda).

Hot, dry; slightly bitter, with a sharp taste; good in ascites; diuretic, emmenagogue, abortifacient; good in lung complaints, coughs, jaundice, both internally and externally; anthelmintic; good in hydrophobia, in tertian fever, in paralysis, and for eye-sores; a good adjunct as a purgative and for piles (Yunani).

The seeds in combination with other drugs are recommended for the treatment of snake-bite and scorpion-sting (Sushruta).

The seeds when bruised are strongly scented, and they are used in Europe as emmenagogues, diuretics, and galactagogues. They are carminative and are an excellent adjunct to purgative draughts.

In eruptions of the skin the seeds reduced to powder and mixed with sesamum oil are much used in India as an external application.

The seeds are useful in mild cases of puerperal fever (Koman).

The seeds are not an antidote to snake venom (Mhaskar and Caius,) and they are uselesss in the treatment of scorpion sting (Caius and Mhaskar).

Afghanistan: Shewadaru, Siyahdaru—; *Arabic:* Habbatussuda, Kamuneavad, Shuniz—; *Bengal:* Kalijira, Kalzira, Mungrela—; *Bombay:* Kalenjire, Kalonji—; *Burma:* Samonne—; *Canarese:* Karejirage, Karijirigi, Karimsiragam—; *Deccan:* Kulanjan—; *Egypt:* Hubsindee—; *English:* Black Cummin, Nutmeg Flower, Small Fennel—; *French:* Cumin noir, Faux cumin, Gith, Nielle de Crête, Nielle romaine, Nigelle cultivée, Nigelle romaine—; *German:* Schwarzkuemmel, Gemeiner Schwarzkuemmel, Roemischer Schwarzkuemmel—; *Gujerati:* Kalonjijirum—; *Hebrew:* Qesah—; *Hindi:* Kalajira, Kalonji, Mugrela—; *Italian:* Cinnamonea, Cuminella, Erba spezie—; *Kashmir:* Tukmigandna—; *Malaya:* Ku sheng—; *Malayalam:* Karunchirakam, Karunshiragam—; *Persian:* Shuniz, Siahdanah, Siyahbiranj—;*Russian:* Tchernushka—; *Sanskrit:* Bashpika, Kalajaji, Karava, Karavi, Krishnajiraka, Kunchi, Kunchika, Kunjika, Musavi, Prathvika, Prithvi, Prithu, Prithuka, Sthulajiraka, Sushavi, Upakunchiraka—; *Sinhalese:* Kaluduru—; *Tamil:* Karunjiragam—; *Telugu:* Nellajeelakaira, Nullajilakara—.

RANUNCULUS (Tourn.) Linn.

Annual or perennial herbs. Radical leaves long-stalked, usually deeply lobed. Stem-leaves alternate, smaller, usually lobed. Flowers regular, panicled. Sepals 5, green, imbricate, soon falling off. Petals 5, yellow, shining, imbricate, each with a thickened glandular spot at the base covered, in some species, with a minute scale. Stamens numerous. Carpels several or many, 1-ovuled, in a globose or oblong head, style short. Fruit a head of small achenes sometimes flattened, the tip of the persistent styles often hooked. —Species 300.—Cosmopolitan.

A. Water plant. Flowers white .... 1. *R. trichophyllus.*
B. Land plants. Flowers yellow
  I. Achenes smooth or granular, not muricate or tubercled, shortly beaked
    1. All leaves undivided, lanceodate, entire or remotely toothed .... 2. *R. lingua.*
    2. Leaves 3-partite. Achenes many in an oblong head, not margined .... 3. *R. sceleratus.*
    3. Leaves ternatisect. Achenes smooth, glabrous, margined .... 4. *R. pensylvanicus.*
  II. Achenes tubercled or muricate
    1. Sepals appressed to and half the length of the petals .... 5. *R. arvensis.*
    2. Sepals reflexed, rather shorter than the petals.. 6. *R. muricatus.*
  III. Achenes gibbous at the side with a long terminal beak .... 7. *R. falcatus.*

The genus is acrid and corrosive.

The following species are used medicinally in Europe—*R. acris* Linn., *R. arvensis* Linn., *R. asiaticus* Linn., *R. bulbosus* Linn., *R. falcatus* Linn., *R. flammula* Linn., *R. glacialis* Linn., *R. gramineus* Linn., *R. hederaceus* Linn., *R. lingua* Linn., *R. monspeliacus* Linn., *R. muricatus* Linn., *R. pedatus* W. & K., *R. parviflorus* Linn., *R. repens* Linn., *R. sceleratus* Linn., *R. thora* Linn., *R. trichophyllus* Chaix., *R. trilobus* Desf.—; in China—*R. acris* Linn., *R. sceleratus* Linn.—; in Indo China—*R. Langsdorfii* DC., *R. pensylvanicus* Linn. f., *R. sceleratus* Linn., *R. ternatus* Thunb.—; in Madagascar—*R. pinnatus* Poir.—; in Southern Africa—*R. capensis* Thunb., *R. pinnatus* Poir.—; in North America—*R. abortivas* Linn., *R. bulbosus* Linn., *R. flammula* Linn.—*R. sceleratus* Linn—.

1. **Ranunculus trichophyllus** Chaix in Vill. Dauph. I (1779) 335.—*R. aquatilis* Linn., (partim) var. *trichophyllus* Hook. f. & Th. in Hook. f. Fl. Brit. Ind. 1 (1872) 16.

Perennial; leaves immersed, multifid with capillary divisions. Flowers less than 1 cm. broad. Peduncles usually shorter than the leaves, sometimes longer. Petals usually narrow, sometimes broad, less than twice as long as the sepals. Stamens few. Achenes numerous, sometimes sparingly pilose or foveolate.

Distribution: Punjab Plain, W. Himalaya from the Indus to Kumaon, up to considerable elevations, Waziristan, Baluchistan.—Afghanistan to N. Africa and Europe, temperate N. and S. hemispheres.

The amount of toxic principle is so small as to be negligible and, in Europe, the plant is given in intermittent fevers, rheumatism, and asthma.

English: Water Crowfoot, Water Fennel—.

2. **Ranunculus lingua** Linn., Sp. Pl. (1753) 549; Blatter Beautiful Fl. Kashmir I (1927) 13, pl. 2, fig. 5.

A tall erect smooth plant; rootstock creeping. Stem 0.6—1.2 m. high, hollow. Aerial leaves 10—20 cm., long, lance-shaped, half-stem-clasping, attached about the middle of the stem, entire or with a few teeth, with parallel veins. The lower leaves which are sometimes submerged are tongue-shaped or heart-shaped, blunt, 7.5 cm. broad, 20—22.5 cm. long. Flowers large, 2.5—5 cm. diam., yellow, in a sort of panicle. Sepals 5. Petals 5. Stamens many. Fruit a head of broad flat pitted achenes with a sword-like beak.

Distribution: Kashmir.—Temperate N. hemisphere.

In Europe the leaves are applied as a blister to the wrists in rheumatism.

English: Great Spearwort, Sparrow Weed, Spear Crow-foot—; *French:* Grande douve, Renoncule lancéolée—.

3. **Ranunculus sceleratus** Linn., Sp. Pl. (1753).—*R. indicus* Roxb. Hort. Beng. (1814) 43. PLATE 5A.

Annual, erect, 0.3—0.6 m. high; stems and branches hollow, deeply furrowed, glabrous. Radical leaves 18—37 mm. diam.,

reniform, 3-partite almost to the base; segments obovate, cuneate, again variously lobed or notched. Upper cauline leaves 3-partite, the segments narrow-oblong, entire or toothed, glabrous. Petioles sheathing, those of the radical leaves variable in length, from 2.5-15 cm., long, those of the cauline leaves becoming shorter upwards, glabrous. Flowers 6—12 mm. diam. Sepals oblong, about equalling the petals, pubescent, caducous. Petals 4—5, elliptic-oblong, white. Anthers yellow. Head of achenes cylindric, 6-9 mm. long; achenes small, numerous, apiculate.

Distribution: Sind, Waziristan, Northern India, Mount Abu, warm valleys of Himalaya, Bengal.—Siam, N. temperate zone.

The fresh plant is poisonous, and produces violent effect if taken internally. The bruised leaves form an application to raise blisters, and may also be used to keep open sores caused by vesication, or by other means (Murray).

The leaves are still used occasionally in Europe as a vesicant. When made into a tincture with spirit of wine, and given in small diluted doses, the plant proves curative of stitch in the side, and of neuralgic pains between the ribs, likewise of pleurisy without feverishness.

In Indo China the seeds are given as a stomachic, to destroy foul breath, to reduce abscesses, and in kidney troubles.

The plant contains an acrid volatile oil, an inert resin, and a narcotic principle called *anemonin.*

Arabic: Kafessaba—; *Catalan: Gata* rabiosa—; *Chinese:* Shih Lung Juei—; *Danish:* Puggepeber—; *Dutch:* Water haanewœt; *English:* Celery-leaved Buttercup, Celery-leaved Crowfoot, Marsh Crowfoot, Water Celery—; *French:* Grenouillette aguatique, Grenouillette d'eau, Herbe sardonique, Mort aux vaches, Renoncule des marais, Renoncule scélérate—; *German:* Blasenziehender Hahnenfuss, Boese Ranunkel, Boesewicht, Froscheppich, Giftranunkel—; *Indo China:* Thach long noi—; *Italian:* Appio riso, Erba sardonica, Pie corvino, Ranocchietta acquatica, Ranunculo di palude—; *Kumaon:* Shim—; *Persian:* Kabikaj—; *Portuguese:* Rainunculo mataboi—; *Spanish:* Ranunculo malvado—; *Tirhut:* Polica—.

4. **Ranunculus pensylvanicus** Linn. f. Suppl. (1781) 272.—*R. chinensis* Bunge En. Pl. Chin. Bor. (1834) 3.

An erect hairy annual. Stem. 0.6—0.9 m., prostrate at the base and often rooting at the nodes, patently hairy. Leaves 3-partite, segments deeply divided; lower on long petioles; leaflets long-stalked and deeply cut into linear segments; upper sessile or nearly so. Flowers about 2.5 cm. diam., yellow. Sepals reflexed. Receptacle pilose. Very variable in the shape of the head of achenes, and in the prominence and position of the intra-marginal rib.

Distribution: Upper Gangetic Plain, Nepal Terai, Khasia Hills up to 6,000 ft.—N. China, Amur-land, N. America.

The plant is used to raise blisters.

Indo China: Tieu hoi hoi toan.

5. **Ranunculus avensis** Linn., Sp. Pl. (1753) 555; Blatter Beautiful Fl. Kashmir (1927) 16, pl. 2, fig. 8.—*R. tuberculatus* DC. Prodr. 1 (1824) 41.

An erect, much-branched, smooth, pale green annual, sometimes hairy above. Stem 15—60 cm. Radical leaves 2.5—7.5 cm. long, stalked, spoon-or wedge-shaped, 3-5-toothed at the tip, otherwise entire. Stem-leaves short-stalked, deeply divided into 2 or 3 narrow segments. Flowers 1.2 cm. diam., pale yellow. Sepals appressed to the petals and half as long. Fruit a globose head of 5—10 flattened prickly achenes, style straight or hooked.

Distribution: W. Himalaya from Kashmir to Kumaon, Mt. Abu.—Siberia, temperate Asia, Afghanistan, Europe, N. Africa.

In Europe the plant is used in intermittent fevers, gout, and asthma.

English: Corn Crowfoot, Crows'-claws, Devil-on-both-sides, Devil's-claws, Devil's Coach-wheel, Devil's Currycomb, Dill-cup, English Stavesacre, Field Crowfoot, Goldweed, Gye, Hard-iron, Hedge-hog, Hellweed, Horse Gold, Hungerweed, Jack-o'-both-sides, Joy, Peagle, Prickle-backs, Scratchbur, Starveacre Urchin Crowfoot, Yellow Crees, Yellowcup—; *French:* Bassinet des champs, Picot, Piquereaux—; *Malta:* Devil's Claws, Hedgehog—; *Punjab:* Chambul—.

6. **Ranunculus muricatus** Linn., Sp. Pl. (1753) 555—*R. cabulicus* Boiss. Diagn. ser. 2, I, 9.

An erect or diffuse, smooth, rarely hairy annual. Stem 10—30 cm. Radical leaves 2.5—5 cm. diam., 3-lobed, lobes irregularly out, rounded or heart-shaped at base; upper leaves wedge-shaped. Flowers 8—12 mm. diam., yellow, solitary and opposite the leaf, or at the end of branches and in panicles. Sepals bent back, rather shorter than the petals. Fruit a large, globose, 8 mm. long head of oval flattened, tubercled or spinous, rarely smooth achenes; beak straight, flattened, ribbed, tip hooked.

Distribution: Punjab Himalaya and Punjab, Kashmir.—W. Asia, Europe, temperate N. America.

In Europe the plant is used in intermittent fevers, gout, and asthma.

7. **Ranunculus falcatus** Linn. Sp. Pl. (1753) 556.

A smooth or slightly woolly, annual herb. Leaves all radical, 3-lobed or pinnately divided, segments narrow, entire or 3-lobed. Flowering stems 1 or more, 2.5—7.5 cm. high, 1-flowered, longer than the leaves. Flowers small, yellow. Stamens 5—15. Achenes gibbous at the sides, with a long beak which is straight or curved.

Distribution: Kashmir, Punjab, Baluchistan.—W. Asia, S.-E. Europe.

If the plant is pounded and applied to the skin it produces blisters (Hughes-Buller).

Baluchistan: Wahwashu—; *Pushtu:* Karamghundai—.

CALTHA (Rupp.) Linn.,

Herbs with stout creeping rootstocks. Leaves chiefly radical, ovate or cordate. Flowers few, terminal, regular, white or yellow. Sepals 5 or more, petaloid, deciduous, imbricate. Petals O. Stamens many. Carpels several, sessile. Follicles many, many-seeded. Seeds many, 2-seriate, with a prominent raphe and think funicle.—Species 20.—Temperate regions.

The genus is acrid and poisonous; but the acrid poison is not developed in the young plants.

1. **Caltha palustris** Linn. Sp. Pl. (1753) 558.—*C. himalensis* D. Don Prodr. Fl. Nep. (1825) 195.—*C. alba* Jacquem. Voy. Bot. 6. —*C. palustris* var. *alba* Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I, 21; Coventry Wild Fl. Kashmir (1923) 11, pl. VI; Blatter Beautiful Fl. Kashmir I (1927) 18, pl. 3, fig. 1.—PLATE 5B.

A glabrous, perennial herb. Rootstock thick, creeping. Stems 15—45 cm., often tufted, erect, robust. Leaves shining, chiefly radical, 5—12.5 cm. across, long-stalked, orbicular or kidney-shaped, deeply cordate; teeth small, close, regular. Stem-leaves alternate, smaller, the upper sessile, embracing the stem like an involucre. Flowers regular, few, 2.5—5 cm. diam., terminal. Sepals 5 or 6, petal-like, bright yellow or white, oval or oblong-obtuse, imbricate. Petals none. Stamens many. Carpels many, sessile, many-ovuled, style short, curved. Fruit a head of narrow, flattened, many-seeded follicles beaked with the persistent styles.

Distribution: W. temperate Himalaya from Kashmir to Nepal, 8,000-10,000 ft.—Temperate Europe and N. America.

In Hazara the root is considered poisonous (Stewart).

In the Pyrenees and in Germany the young buds are pickled like capers.

The toxic jrinciples are jervine and helleborin.

English: Bassinet, Big Watercup, Blob, Boots, Bull-flower, Butter-blob, Carlock-cups, Chirms, Claut, Crow Cranes, Crazy, Dandelion, Drunkard, Fire o' Gold, Golden Cup, Goldins, Golds, Gollin, Great Butter-flower, Halcups, John Georges, Johnny Cranes, Kingcob, King Cup, Mare-blob, Marsh Mallow, Marsh Marigold, May Blobs, Mayflower, Meadow Bouts, Meadow Bright, Meadow Gowan, Moll-blob, Open Gowan, Publican & Sinners, Soldiers' Buttons, Water Buttercup, Water Goggles, Water Gowan, Yellow Gowan—; *German:* Butterblume, Dotterblume, Sumpfdotterblume—; *Punjab*: Baringu, Mamiri—; Spanish: Yerba centella—.

Coptis Salisb.

Small stemless herbs; rootstock perennial. Leaves ternatisect. Flowers regular, small, white, on slender leafless scapes. Sepals 5-6. Petals 5-6, clawed, hooded or linear. Carpels few or many,

pedicelled, spreading; ovules many. Follicles many-seded. Seeds with a black crustaceous testa.—Species 10.—N. temperate and arctic regions.

The genus is tonic and bitter.

The following species are used medicinally in Japan—*C. anemonifolia* Sieb. & Zucc.—; in China—*C. teeta* Wall.—; in Indo China—*C. anemonifolia* Sieb. & Zucc.—; in Malaya—*C. anemonifolia* Sieb. & Zucc., *C. teeta* Wall.—; in North America—*C. trifolia* Salisb.—.

Berberine has been isolated from *C. trifolia* and *C. teeta.*

OFFICIAL :—the dried rhizome of the plants belonging to the genus Coptis, grown in Japan (Japan).

1. **Coptis teeta** Wall. in Linnaea 12 (1838) Litt. 227; Griff. Notul. IV, 733, Ic. IV, t. 660, f. 2.—PLATE 6.

Small stemless herbs. Rootstock horizontal, perennial, golden yellow, woody, densely fibrous, very bitter. Leaves ternatisect, glabrous, petioles 15—30 cm.; leaflets 5—7.5 cm., ovate-lanceolate, pinnatifid, lobes incised, terminal largest. Scape equalling the leaves. Flowers 1-3-pedicelled, regular, small, white on slender leafless scapes. Bracts leafy. Sepals 5—6, 12 mm., oblong-lanceolate, acute. Petals 5—6, narrow, ligulate, obtuse, $^2/_3$ shorter than the sepals. Carpels pedicelled, spreading. Ovules many. Follicles many-seeded. Seeds with a black crustaceous testa.

Distribution: Temperate regions of Mishmi Mts., east of Assam.

The root is an all round tonic and stomachic medicine. It has been found to produce excellent effects in debility, convalescence after fevers and other debilitating diseases, atonic dyspepsia, and in mild forms of intermittent fevers.

It contains berberine.

Assam : Mishmeeteeta, Tita—; *Bombay :* Mamiran, Mishmitita—; *Cantonese:* Choon lin—; *Chinese :* Huang Lien—; *English :* Coptis, Gold Thread—; *French :* Coptide—; *Hindi :* Mamira, Mamiran, Mishmitita—; *Malaya :* Choon lin—; *Sind :* Mahmira—; *Sinhalese :* Pitakarosana—.

Delphinium Tourn. ex Linn.

Annual or perennial erect herbs. Leaves palmately lobed. Flowers racemed or panicled, irregular, white blue or purplish. Sepals 5, free or cohering at the base, dorsal spurred behind. Petals 2-4, small; spurs of the 2 dorsal developed within that of the sepal; 2 lateral spurless or 0. Stamens many. Follicles 1-7. Seeds many, testa wrinkled or plaited.—Species 150.—N. temperate zone.

I. Spur subulate
 1. Radical leaves 5-15 cm. diam., orbicular, divided to the base or nearly so, 5-9-parted. Follicles 3 . . . . . 1. *D denudatum.*
 2. Radical leaves 3-4 cm. diam., suborbicular, 5-7-lobed. Follicles 5 . . . . 2. *D. caeruleum.*
 3. Radical leaves 10-15 cm. diam., orbicular or reniform, 5-7-lobed or—parted. Follicles 3 . . . . 3. *D elatum.*
II. Spur inflated, conical . . . . 4. *D. brunonianum.*

The flowers are acrid, bitter, astringent; the seeds are emetic, cathartic, anthelmintic, and insecticidal.

The following species are used medicinally in Europe—*D. ajacis* Linn., *D consolida* Linn., *D. elatum* Linn., *D. gradiflorum* Linn., *D. hybridum* Willd., *D. laxiflorum* DC., *D. montanum* DC., *D. orientale* Gay., *D. palmatifidum* DC., *D. peregrinum* Linn., *D. pubescens* DC., *D. staphisagria* Linn., *D. triste* Fisch.—; in Indo China—*D. ajacis* Linn.—; in North America—*D. ajacis* Linn., *D. consolida* Linn., *D. staphisagria* Linn.—.

Ajacine, and ajaconine have been isolated from the seeds of *D. ajacis ;* delphinine, delphisine, delphinoidine, and staphisagroine have been obtained from the seeds of *D. staphisagria.*

OFFICIAL:—The seeds of *D. staphisagria* Linn. (France, Great Britain, Holand, Portugal); *D. consolida* Linn., the flowering plant (Portugal).

1. **Delphinium denudatum** Wall. Cat. n. 4719 ; Collett Fl. Siml. (1902) 12, fig. 4; Blatter Beautiful Fl. Kashmir I (1927) 22, pl. 4, fig. 5.—*D. pauciflorum* Royle Ill. Bot. Himal. 55.—PLATE 7A.

Glabrous or slightly downy herbs. Stems 0.6—0.9 m., branched. Radical leaves 5—15 cm. across, orbicular, long-stalked, divided nearly to the base segments 5—9, narrow, pinnately lobed, often toothed ; stem-leaves few, shortly stalked, upper sessile, more or

less deeply 3-lobed, lobes narrow, mostly entire, Flowers few, scattered, 2.5—3.8 cm. long, spur cylindric, nearly straight. Sepals spreading, varying from deep blue to faded grey. Petals blue, the lateral ones 2-lobed, hairy. Anterior petals deeply 2-fid, hairy on both surfaces. Follicles 3, inflated, glabrous or sparsely hairy.

Distribution: *W.* temperate Himalaya from Kashmir to Kumaon, 8,000—12,000 ft.

The root is bitter; cooling, vulnerary, alexiteric; cures "kapha," "vata," diseases of the blood, snake-bite, and scorpion sting (Ayurveda).

Five varieties; very hot, slightly sweet at first then bitter; stimulant in conditions of debility; appetiser; brain tonic, used in insanity; good in tooth ache and in painful piles; astringent, a purgative should be given with it; an antidote to snake and scorpion venoms (Yunani).

The root is used in Bashahr for toothache and also as an adulterant for aconite (Stewart).

It is not an antidote to either snake venom (Mhaskar and Caius) or scorpion venom (Caius and Mhaskar).

Arabic : Judwar, Mahferfin—; *Bhutia* : Nirbisi—; *Canarese* : Nirvishi—; *Gujerati* : Nirvishi—; *Hindi* : Judwar, Nirbishi, Nirbisi—; *Marathi* : Nirvishi—; *Nepal* : Nilobikh—; *Persian* : Zadwar—; *Sanskrit:* Apavisha, Avisha, Nirvisha, Vishabhava, Vishaha, Vishahantri, Vishavairini, Vivisha—; *Simla* : Manila—; *Urdu* : Jadwar—.

2. **Delphinium caeruleum** Jacq. ex Camb. in Jacq. Voy. Bot. 7, t. 6.—PLATE 8.

An erect herb. Stem 7.5—30 cm., much-branched from the base, leafy, spreading. Leaves suborbicular, 3—3.7 cm. diam., 5—7—lobed, lobes cuneate-oblong, incised or pinnatifid, segments linear. Radical leaves divided to the base. Flowers solitary in long branches or few in a loose raceme, pale blue, hairy. Sepals shorter than the nearly straight spur. Spur subulate. Anterior petals obovate or obcordate, a little hairy. Follicles 5, hairy.

Distribution: Alpine Himalaya from Kumaon to Sikkim, up to 17,000 ft. in the Eastern Himalaya.

The root is applied to kill the maggots in the wounds of goats (Stewart).

Punjab: Dakhangu—.

3. **Delphinium elatum** Linn. Sp. Pl. (1753) 531.—*D. intermedium* Ait. Hort. Kew. ed. I, II, 243.—*D. ranunculifolium* Wall. Cat. no. 4716.—*D. pyramidale* Royle Ill. Bot. Himal. 56.—*D. Hoffmeisteri* Klotzsch. Bot. Ergeb. Pr. Waldem. Reise (1862) 132.—*D. speciosum* Janka ex Nym. Consp. 20.

Stem 0.6—1.2 m. high, little-branched, hairy or smooth. Leaves 10—15 cm. diam., rounded or kidney-shaped in outline, pale beneath, 5—7—lobed or parted to the base ; segments wedge-shaped-oblong, 3-lobed or variously cut. Flowers pale blue or purplish, hairy outside, on much-branched recemes; flower-stalks 2.5—7.5 cm. Sepals 5, blunt. Spur as long as the sepals, awl-shaped. Fruit of 3 follicles which open down one side when ripe.

Distribution: W. temperate Himalaya from Kashmir to Kumaon, 10,000—12,000 ft.

The whole plant, but more especially the seed, is emetic, asperient, diuretic, and anthelmintic.

In Europe the seeds are used as insecticides, and much employed in the treatment of itch and other skin eruptions. The flowers are astringent and used in troubles of the eye.

The toxic principles are delphinine, delphisine, and delphinoidine.

4. **Delphinium brunonianum** Royle Ill. Bot. Himal. 56 ; Hook. Bot. Mag. t. 5461.—*D. Jacquemontianum* Camb. in Jacq. Voy. Bot. 8, t. 7.—*D. moschatum* Munro in Hook. f. & Th. Fl. Ind. (1855) 53.

An erect herb. Stem glabrous or downy below, glandular-pubescent above, 15—30 cm., simple below, leafy. Leaves 5-fid to the middle, 7.5—10 cm. diam., lobes sharply cut or toothed, cuneate-ovate ; petioles very long. Inflorescence corymbose ; corymbs sometimes compound. Flowers large, pale blue, hairy ; bracts 3—5—partite, upper simple, oblong or linear. Sepals connivent, 2.5 cm., membranous, orbicular, veined, longer than the conic and inflated spur. Follicles 5—6, 1.8 cm. viscidly pubescent.

Distribution: Alpine region of W. Tibet, 14,000 ft.

The juice of the leaves of this plant is used in Kurram to destroy ticks in animals, chiefly when they affect sheep. In Leh it is considered so poisonous that the dew from the leaves falling on grass is said to poison cattle and horses (Aitchison).

Garhwal : Kasturi—; *Kumaon :* Nepari—; *Ladakh :* Ladara—; *Pangi :* Mundwal—; *Ravi :* Sapfalu—; *Sutlej :* Laskar, Liokpa, Panni, Ruskar, Spet, Supalu—.

ACTÆA (Tourn.) Linn.

An erect perennial herb. Leaves alternate, ternately compound. Flowers small, in short crowded racemes. Sepals 3—5, rather unequal, petaloid. Petals 4—10, small, spathulate, or 0. Stamens many, filaments slender. Carpel 1, many-ovuled; stigma sessile, dilated. Berry many-seeded. Seeds depressed; testa coriaceous, smooth.—Species 10.—N. temperate regions.

The root is emetic and purgative; the flower, the stem and the leaf are poisonous to insects.

1. **Actaea spicata** Linn. Sp. Pl. (1753) 504 ; Conventry Wild Fl. Kashmir (1923) 15, pl. VIII ; Blatter Beautiful Fl. Kashmir I (1927) 20, pl. 3, fig. 5.—*A. acuminata* Wall. Cat. 4726; Royle Ill. Bot. Himal. 57.—PLATE 22B.

An erect perennial herb, more or less hairy. Stem 0.6-0.9 m. high, usually branched. Leaves about 0.3 m., alternate, ternately compound, leaflets pointed, often lobed, deeply and sharply toothed. Flowers regular, scarcely 6 mm. diam., white crowded in short, terminal racemes which become longer in fruit. Sepals 4, petal-like, concave, falling early. Petals 4, shorter than the sepals. Stamens many longer than the sepals ; anthers small. Fruit a black, ellipsoid, smooth burry, about 12 mm. long, containing about 10 seeds.

Distribution: Temperate Himalaya from Hazara to Bhutan.—N. Asia, Europe, N. America.

The root is an active emeto-purgative.

In some parts of Europe the powdered leaves, stems, and flowers are used as an insecticide.

Canadian doctors administer the root in snake-bite; and it is

said to be attended with much success in the treatment of nervous diseases, rheumatic fever, chorea and lumbago. The berries were formerly used internally for asthma and scorfula, and externally for skin complaints.

The root is useless as an antidote to snake-bite (Mhaskar and Caius).

The toxic principle is referred to as "oil of baneberry."

English : Baneberry, Grapewort, Herb Christopher—; *French :* Actée, Actée en épi, Christophoriane, Faux hellébore noir, Herbe aux poux, Herbe de saint Christophe—; *German:* Christophskraut, Christophswurz—; *Italian :* Barba di capra—; *Spanish :* Yerba de San Christobal—.

Cimicifuga Linn.

Erect perennial herbs. Leaves 2—5—ternately divided. Flowers in long slender racemes, regular. Sepals 4—5, deciduous, petaloid. Petals (or transformed stamens) 1—8, small, clawed, 2-horned at the tip. Stamens many, filaments slender. Carpels 1—8, many-ovuled. Fruit of many-seeded follicles. Seeds compressed, testa smooth or scaly.—Species 12.—N. temperate regions.

The poisonous root has emetic and purgative properties.

C. fœtida Linn., is used medicinally in Europe, China, and Indo-China; *C. racemosa* (L.) Nuttall in North America.

Official :—The dried rhizome and roots of *C. racemosa* (United States).

1. **Cimicifuga fœtida** Linn. Syst. ed. 12, 659 (non Pursh); Conventry Wild Fl. Kashmir (1923) 17, pl. IX.—*C. frigida* Royle Ill. Bot. Himal. 57.—*Actaea cimicifuga* Linn. Sp. Pl. (1753) 504. —Plate 22A.

A perennial, more or less pubescent herb. Stems 0.9—1.8 m., erect, leafy, branched. Leaves 15—45 cm., pinnately compound ; leaflets 2.5-7.5 cm., rarely more, ovate or lanceolate, deeply and sharply toothed, terminal leaflet 3-lobed. Flowers nearly regular, hardly 6 mm. diam., white, crowded in short or long racemes, solitary in the axils of the upper leaves, and combined in a terminal, some-

times large and spreading, panicle. Sepals and petals 5—7 (no clear distinction between them), imbricate, ovate, concave ; one or two of the inner ones deeply 2-lobed, the tips white, broad, notched. Stamens numerous, ultimately longer than the sepals. Ovaries 2—5, rarely more, many-ovuled, style short, stigma pointed. Follicles 12 mm. long, flat, tipped with the persistent styles. Seeds 6—8.

Distribution: Temperate Himalaya, from Kashmir to Bhutan 7,000—12,000 ft.—E. Europe, Siberia.

In Europe the root is considered a mild emeto-purgative. In China and Indo China it is used as an antiperiodic and sudorific, and prescribed in rheumatic affections, dropsy, the early stage of phthisis, and chronic bronchial diseases.

In Siberia the root is used to drive away bugs and fleas.

Chinese : Sheng Ma—; *English :* Bugbane—; *French :* Actée fétide, Chasse-punaise, Cimicaire, Herbe aux punaises—; *German :* Wanzenkraut—; *Punjab :* Jiunti—; *Spanish :* Yerba de las chinches—.

Paeonia (Tourn.) Linn.

Erect, stout, leafy, perennial herbs or undershrubs. Leaves alternate, compound. Flowers large, solitary or panicled, white or red. Sepals 5, herbaceous, persistent. Petals 5—10, larger than the sepals. Stamens many. Carpels 1—5, girt below by a fleshy disk, many-seeded. Fruit of 1 or more coriaceous few-seeded follicles. Seeds large, subglobose, testa thick ; albumen fleshy.—Species 15.—Europe, Asia, W. N. Africa.

This genus contains a toxic acrid juice. The root is antispasmodic ; the seeds are emetic and cathartic.

The following are used medicinally in Europe—*P. corallina* Retz., *P. moutan* Sims., *P. officinalis* Linn., *P. peregrina* Mill., *P. tenuifolia* Linn.—; in Japan, China, and Indo China—*P. albiflora* Pall., *P. moutan* Sims.—; in California—*P. brownii* Dougl.—.

1. **Paeonia emodi** Wall. Cat. 4727 ; Conventry Wild Fl. Kashmir (1923) 19, pl. X; Blatter Beautiful Fl. Kashmir I (1927) 26, pl. 6 fig. 5.—Plate 23.

A glabrous, perennial herb.

Stems 0.3—0.6 m., leafy, erect. Leaves alternate, 15—30 cm. long ; leaflets 3, usually 3-parted, segments lanceolate, pointed, entire. Flowers few, showy, 7.5—10 cm. across, long-stalked, usually solitary in the axils of the upper leaves. Buds globose. Sepals 5, orbicular, concave, green, persistent, the outer ones ending in a leaf-like point. Petals 5—10, broadly ovate, concave, red or white. Stamens many. Ovaries 1—3, densely hairy, many-ovuled, seated on a fleshy disk ; style short, broad, recurved. Follicles ovoid, 2.5 cm. Seeds few, large.

Distribution: W. Himalaya from Kashmir to Kumaon.

The tubers are of two kinds ; sweetish acrid taste ; causes loss of appetite ; used in epilepsy and headache, in uterine diseases and bladder troubles ; given with milk as a blood purifier ; diuretic ; good in dropsy and haemoptysis (Yunani).

The tubers of this plant are highly esteemed as a medicine for uterine diseases, colic, bilious obstructions, dropsy, epilepsy, convulsions and hysteria. *Ud-salap* is generally given to children as a blood-purifier.

In Booner, the root in combination with other drugs is a favourite remedy for bruises, sprains, etc. (Bellew).

An infusion of the dried flowers is highly valued as a remedy for diarrhoea.

The seeds are emetic and cathartic.

Bhutia : Bhumamadiya, Yetghas—; *English :* Himalayan Paeony, Paeony Rose—; *Hindi :* Udsalap—; *Kashmir.:* Mid—; *North-Western Privinces :* Chandra—; *Punjab :* Mamekh—; *Urdu :* Udasaliba.—.

Aconitum Tourn. ex Linn.

Perennial, erect, rarely twining herbs. Leaves palmatipartite, rarely entire. Flowers irregular, racemed, blue purple white or yellow. Sepals 5, petaloid, posterior (helmet) vaulted, the rest flat, 2 anterior narrower than the lateral. Petals 2—5 ; 2 posterior clawed, limb hooded and enclosed in the helmet, 3 lower small or

obsolete. Stamens many. Follicles 3—5, sessile. Seeds many; testa spongy, rugose or wrinkled.—Species 110.—N. temperate regions.

All the botanical information regarding the Indian species of Aconitum is borrowed from 'The Aconites of India. A Monograph' by O. Stapf (Annals Roy. Bot. Gard. Calc. vol. X (1905) 115—197. In the following we simply refer to Stapf Ind. Acon.

A. Root perennial, long, fusiform usually breaking up at length into cordlike anastomosing or free strands; old plants often with several stems from the collar .... 1. *A. luridum.*

B. Roots biennial, paired, tuberous; each tuber producing normally one simple or rarely branched stem.

I. Stem erect, rarely ascending, never twining

1. Seed-angles winged, faces smooth or almost so (not transversely lamellate)

a. All the leaves distinctly to very long-petioled, cordate-orbicular or reniform in outline, deeply dissected,

aa. Tubers 2—3.5 cm., long, fracture in the dry state horny or cartilaginous, brown (at least the part outside the cambium); taste slightly bitter, followed by a tingling sensation; carpels 5, glabrous or nearly so, never tomentose .... 2. *A. chasmanthum.*

bb. Tubers 0.5—2.5 cm. long, fracture in the dry state almost farinaceous, pure white; taste indifferent or slightly sweetish, not followed by any tingling sensation; carpels d e n s e l y tomentose; honey-gland sub-terminal .... 3. *A. violaceum.*

b. All the leaves with the exception of the lowest shortly petioled to sub-sessile, cordate-ovate, coarsely crenate .... 4. *A. heterophyllum.*

2. Seeds with hyaline wavy transverse lamellæ

a. Cambium of tubers discontinuous, forming in cross-section circular or tangentially flattened to horseshoe-shaped strands

aa. Nectary-hood very slender with a minute lip; carpels quite glabrous; taste of tubers intensely and pure bitter, not followed by any tingling sensation .... 5. *A. palmatum.*

bb. Nectary-hood wide with a rather large lip; carpels hairy; taste of tubers rather indifferent, followed by a strong and persistent tingling sensation

α Inflorescence and carpels greyish pubescent; leaves divided almost to the base, ultimate divisions narrow; carpels usually 3 .... 6. *A. deinorrhizum.*

β Inflorescence and carpels spreadingly yellowish tomentose; leaves rather less divided than in the preceding species, ultimate divisions broad; carpels 5 .. 7. *A. balfourii.*

b. Cambium of tubers continous, forming in cross-section a more or less sinuous ring.

aa. Secondary sieve-strands of mother-tubers not encased in sclerenchymatic sheaths; lip of nectary widened from the base upwards; leaf-segments not or slightly divaricate.

α Leaves divided to 6/7 in the inner, to ¾ or less in the outer incisions, ultimate divisions rather broad; carpels 5; follicles 10-18 mm., long.

αα Intermediate leaf-division rhomboid-cuneate, sparingly and coarsely inciso-crenate; nectary-hood much leaning forward, slightly widened at the top, scarcely gibbous; carpels glabrous; or nearly so; follicles 14-18 mm. long .... 8. *A. falconeri.*

ββ Intermediate leaf-division mostly ovate in outline, copiously inciso-crenate or dentate; nectary-hood slightly leaning forward, distinctly gibbous at the top; carpels villous; follicles about 10 mm. long .... 9. *A. spicatum.*

β Leaves divided almost to the very base, ultimate divisions narrow; carpels mostly 3; follicles 18-25 mm. long .... 10. *A. laciniatum.*

bb. Secondary sieve-strands of mother-tubers encased in sclerenchymatic sheaths, forming persistent fibres; lip of nectary narrow; leaf-segments conspicuously divaricate ...... 11. *A. Ferox.*

II. Stem very slender, twining

1. Flowers on recurved pedicels (up to 5 cm., long), nodding; helmet conic-ovate in profiile .... 12. A. *A. clwesii.*
2. Flowers on straight or almost straight pedicels (up to 7.5 cm. long); helmet depressed, semi-orbicular in profile .... 13.A. *A. lethale.*

Aconites are at once highly poisonous and most valuable medicinal plants.

The following species are used medicinally in Europe—*A. Anthora* Linn., *A. cammarum* Linn., *A. lycoctonum* Linn., *A. napellus* Linn., *A. variegatum* Linn.—; in Japan and China—*A. fischeri* Reich., *A. lycoctonum* Linn., *A. napellus* Linn.—; in Indo China—*A. fischeri* Reich., *A. kusnezofii* Reich., *A. lycoctonum* Linn., *A. napellus* Linn.—; in North America—*A. napellus* Linn.—.

Those aconite alkaloids which have been fully examined belong to two well-defined groups:—(1) aconitines, which are highly poisonous—aconitine and bikhaconitine from *A. napellus*, indaconitine from *A. chasmanthum*, japaconitine from Japanese hondo aconite roots, pseudaconitine from *A. deinorrhizum* and *A. balfourii*, jesaconitine from Japanese bashi aconite roots, lappaconitine and lycaconitine from *A. lycoctonum*—, (2) atisines, which are not toxic—atisine from *A. heterophyllum*, palmatisine from *A. palmatum*.

OFFICIAL :—The root of *A. Napellus* (Belgium, Great Britain, Holland, Italy, Japan, Portugal, Russia, Spain, Switzerland, United States), the fresh leaf and root (France).

1. **Aconitum luridum** Hook. f. & Th. Fl. Ind. I (1855) 55 ; Hook. f. Him. Journ. II (1854) 108; Stapf. Ind. Acon. 138, pl. 93.

Root perennial, descending, elongate, cylindric, ultimately breaking up into separate or anastomosing strands. Stem erect, from a simple or, in old specimens, 2—or several-headed collar which is covered with the brown, dilated bases of the old petioles, unbranched, up to 80 cm. high, softly hairy to tomentose or sometimes glabrate towards the base, hairs spreading, rarely curved and adpressed. Leaves few (up to 4) from the collar on very long (up to 30 cm.) petioles which are dilated at the base ; 3—6, rarely more, from the stem, distant, similar to the basal, but gradually smaller with narrower divisions and the upper with rapidly decreasing petioles, basal and lower blades hairy on both sides (below chiefly on the nerves), orbicular-cordate or reniform in outline, with a narrow or more often wide sinus (1—2 cm. deep), 2.5—6.5 cm. from the sinus to the tip, 5—7, rarely 12 cm. across, 5-palmatipartite to ¾ (in the largest to

6/7), inner divisions obovate-cuneate, 1.5—3 cm. wide, 3-lobed, outermost trapezoidal, 2-lobed, lobes sparingly and acutely inciso-dentate or apiculate-crenate. Inflorescence racemose, up to 40 cm. long, narrow, rather dense, rarely with a few additional branches from the base, with same (if not denser) indumentum as the stem, lowest bracts 3-partite, the others lanceolate or the uppermost sub-linear, exceeding the pedicels ; pedicels erect, short to very short, except the very lowest which may be 2.5—3.5 cm. long ; bracteoles, if present, small linear. Sepals lurid, reddish or brownish red to purple without, yellowish within, hairy, upper sepal helmet-shaped, broad, hemi-elliptic in profile in the upper part, 5—7 mm. high, gradually descending into an obtuse beak of equal or more than equal length ; lateral sepals somewhat obliquely obovate, scarcely clawed, 9—11 mm. long, 7—7.5 mm. broad ; lower sepals deflexed, oblong, obtuse, 8—9 mm. long. Nectaries hammer-shaped, glabrous, claw erect, 4—5 mm. long ; hood at a right angle to the claw, obliquely oblong, very obtuse ; lip horizontal or slightly deflexed, shortly 2-lobed. Filaments 6—9 mm. long, glabrous, broadly winged up to or beyond the middle, wings abruptly contracted. Carpels 3, contiguous and very oblique to horizontal in the flower, obliquely oblong, densely hairy, rarely almost glabrous, shortly contracted into the somewhat shorter styles. Follicles erect, contiguous, oblong, subtruncate, 10-12 mm. long, glabrescent. Seeds triquetrous, oblong, up to 3 mm. long, blackish brown; angles unequally winged, dorsal face transversely wrinkled, ventral faces smooth.

Distribution: Himalaya from Eastern Nepal to Chumbi, 12,000—14,000 ft.

Reputed poisonous.

Bengal: Bish, Butsnabbish—; *Bombay:* Butchnab—; *Hindi:* Mahoor—; *Nepal:* Atisingeeabish, Bikh, Bish, Bishnak—; *Telugu:* Ativassa—.

2. **Aconitum chasmanthum** Stapf ex Holmes Mus. Rep. Pharm. Soc. Great Br. (1903) 2; Ind. Acon. 142, pl. 96.—*A. Napellus* var. *spicatum* Duthie in Rec. Bot. Surv. Ind. I, no. 3, p. 37 (partim).—*A. Napellus* Stewart Punj. (1869) 2 (non Linn.).—*A. Napellus* var.

hians Goris in Bull. Sc. Pharmac. III (1901) 112, f. 28.— *A. hians* Watt. in Agric. Ledg. no. 3 (1902) 101 (non Reichb.).— *A. dissectum* Watt. l.c. 100 (partim, non. D. Don).

Roots biennial, paired, tuberous; daughter-tuber conic to conic-cylindric from a broad base, 2.5-3.7 (rarely to 5) cm., 12-18 mm. thick, bearing more or less numerous root-fibres leaving behind the indurated bases when breaking off, dark brown to blackish brown, smooth or wrinkled when dry, fracture cartilaginous, hard, white within the cambium ring, brownish without, taste slightly bitter, followed by a very persistent strong tingling sensation, cambium continuous, forming a wide central strand, sinuous in cross-section; mother-tuber shrunk, deeply grooved and wrinkled, black outside, brown right through. Innovation-bud conic, short from a very broad base. Stem erect, simple inclusive of the inflorescence, 60-120 cm. high, rather stout, crispo-pubescent above, glabrous below, or almost glabrous all along. Leaves numerous, usually more distant in the lower part and crowded in the upper or more equally distributed, the lowest on petioles up to 7.5 cm. long, the upper shortly petioled or subsessile, passing into the floral leaves, quite glabrous, somewhat fleshy, lower and intermediate blades orbicular, reniform in outline, 4-6 cm. high, 5-9 cm. across 3-palmatipartite almost to the very base, intermediate segment obovate-cuneate, long attenuated at the base, 3-lobed to the middle or beyond, lobes laciniate or the middle lobe pinnati-partite, ultimate laciniate linear, acute to very acute, lateral segments deeply 2-partite and laciniate with the inner division similar to the intermediate segment and the outer 2-lobed and smaller; uppermost blades similar to the preceding but smaller, relatively longer and more sparingly divided. Inflorescence a long, narrow, stiff, dense or loose raceme, often over 30 cm. long, often leafy below and sometimes with slender, erect additional branches from the base, crispo-pubescent; rhachis stout; floral leaves like the preceding leaves, but still less divided or entire, passing into the linear to filiform bracts; bracteoles, if any, small; pedicels slender, the lowest at length 2.5-3.5 cm. long and adpressed to the rhachis when mature. Sepals blue or whitish and variegated with blue, crispo-pubescent or almost glabrous; uppermost helmet-shaped, helmet more or less depressed

into a distinct and often long and slender beak, 15-20 mm. high, 12-18 mm. long from the tip to the base, 5-7 mm. wide (seen from the side), lateral margin conspicuously concave; lateral sepals not contiguous with the helmet except near the base, obliquely suborbicular or almost square, shortly or obscurely clawed, 12-15 mm. long and broad, lower sepals oblong, obtuse, 9-12 mm. long. Nectaries extinguisher-shaped, gabrous; claw 5-6 mm. long, leaning forward in the upper part; hood short, wide, very obtuse, top slightly gibbous on the back, honey-gland occupying the whole top or the gibbosity. Filaments glabrous or very sparingly hairy, winged, wings gradually or abruptly attenuated. Carpels 5, glabrous, rarely very sparingly hairy on the back, conniving, abruptly contracted into the short style, back convex. Follicles oblong, truncate, 10-16 mm. long, contiguous or with slightly divergent tips, glabrous. Seeds brown, obovoid to obpyramidal, 3.5 mm. long, unequally 3-winged, wings thin, faces smooth.

Distribution: Subalpine and Alpine zone of the Western Himalaya, from Chitral and Hazara to Kashmir, between 7,000 and 12,000 ft.

The poisonous root contains the alkaloid indaconitine.

Jhelum: Mohri, Piun—; *Kashmir:* Banbalnag—;

3. **Aconitum violaceum** Jacquem. in Stapf Ind. Acon. 144, pl. 97; Blatter Beautiful Fl. Kashmir I (1927) 24, pl. 5, f. 6.—*A. multifidum* Royle Ill. Him. (1834) 45, 56 (non koch ex Reichb.)—"*A. dissectum (Hamiltoni* or *speciosum)*" Madden in Journ. As. Soc. Beng. 15 (1846) 95 (non D. Don).—*A. Napellus* Clegh. Rep. For. Punj. and W. Himal. (1864) 67 (non Linn.).—*A. Nepellus* var. *multifidum* and var. *rigidum* (partim) Hook.f. & Th. in Hook.f. Fl. Brit. Ind. I, 21.—*A. Nepellus* var. *dissectum* Duthie in Rec. Bot. Surv. Ind. I, no. 3, 37.

Roots biennial, paired, tuberous; daughter-tuber ovoid to shortly fusiform, 0.75-1.8 cm. long, 4-6 mm. thick, bearing few fine root-fibres, breaking off easily, bark very thin whitish to brown, smooth, fracture pure white, slightly sweetish, not followed by any tingling sensation, more or less farinaceous, cambium continuous, forming a central strand, circular or elliptic in cross-section; mother-tuber

shrunk, grooved and wrinkled, brownish internally. Innovation-bud conical, up to 5 mm. long. Stem erect or ascending from a slender, short or long (up to 6 cm.) hypogaeous base, simple or very rarely branched below, slender, crispo-pubescent to tomentose above, glabrous below, rarely quite glabrous, epigaeous part (including the flowers) 10-30 cm. high. Leaves very few (1 or 2), if any, on the hypogaeous stem, often much reduced or withered at the time of flowering, then 3-5 (rarely more) more or less crowded at the base of the epigaeous part of the stem, coëtaneous with the flowers, somewhat fleshy, glabrous or very sparingly pubescent, usually 1 or 2 higher up on the stem, often much reduced; all except the uppermost on long (3.5-12 cm.) slender petioles, widened at the base, lower blades orbicular-cordate or reniform in outline, with a wide or narrow sinus (1-2.5 cm. deep), 1.5-3 cm. high from the sinus to the top, 2.5-5 cm. across, 5-palmati— or subpedati-partite almost to the base, divisions very broad, obovate-cuneate, deeply 3— (or the outermost 2—) partite, secondary divisions laciniate, laciniae linear, acute or very acute, more or less divaricate, rarely shorter subacute and more approximate; upper cauline leaves similar to the preceding, but smaller to very small, shortly petioled or subsessile, more sparingly dissected. Inflorescence a short, lax or dense few-flowered raceme or corymb or reduced to a solitary flower, some times with additional 1-3-flowered branches springing from the cauline or basal leaves, and almost as long as the main rhachis, greyish pubescent to fulvo-tomentose, rarely quite glabrous, rhachis slender, sometimes very short; bracts like the uppermost leaves, or still more reduced; bracteoles, if any, linear to fiiliform, entire; pedicels slender, lower ones 1.5-5 cm. long, erect, indumentum more spreading and denser in the upper part. Sepals violet, blue or yellowish and variegated with blue, pubescent; uppermost helmet-shaped or almost navicular, obliquely erect, somewhat depressed, shortly rostrate, 14-20 mm. high, 18-24 mm. long from the tip to the base, 7-10 mm. wide (seen from the side) at or above the middle; lateral sepals contiguous with the uppermost, very oblique, broadly obovate, scarcely clawed, about 14-16 mm. long, 12-14 mm. broad, lower sepals deflexed, elliptic, obtuse or subacute, about 12 mm. long. Nectaries extinguisher-shaped, glabrous, claw

erect, leaning forward in the upper part, 15-18 mm. long, hood more or less oblique, short, wide, very obtuse, gibbous on the back near the top; lip broad, truncate, crenulate, more or less recurved, honey-gland in the posticous gibbosity. Filaments finely and rigidly hairy in the upper part, winged below, wings gradually or abruptly attenuated or running out into minute teeth, 5-7 mm. long. Carpels 5, conniving, contiguous, oblong, somewhat abruptly or gradually contracted into the style, densely tomentose. Follicles oblong, truncate, erect, contiguous, 10-12 mm. long, densely hairy. Seeds 3-sided, obpyramidal or ellipsoid, 2.5-3 mm. long, angles winged, wings hollow, faces smooth.

Distribution: Alpine zone of the Himalaya from Gilgit to Kumaon, between 10,000 and 15,000 ft.

The root is reputed poisonous.

4. **Aconitum heterophyllum** Wall. Cat. 4722 (nomen tantum); Royle Ill. Himal. (1834) 56, t. 13; Moodeen Sheriff Suppl. Pharmac. Ind. (1869) 27, 28, Flück. & Hanb. Pharmacogr. 14; Bentl. & Trim. Med. Pl. no. 7 with pl.; A. Meyer in Archiv. Pharm. ser. III, 18 & 19 (1881) 175, 269-273; Dymock Mat. Med. W. Ind. 4; Dymock, Warden & Hooper Pharm. Ind. 15; Watt. Dict. Ec. Prod. Ind. I, 91; Dunst. & Jowett in Agric. Ledg. (1896) no. 32; Staff in Ind. Acon. 151, pl. 100:—*A Atees* Royle in Journ. As. Soc. Beng. I (1832) 459 (nomen tantum). —*A. cordatum* Royle Ill. Himal. (1834) 56. —*A. ovatum* Lindl. in Bot. Reg. XXVI (1840) Misc. 53.

Roots biennial, paired, tuberous; daughter-tuber cylindric to cylindric-oblong or conic, 2-5 cm. long, 0.5-1.2 cm. thick (much smaller in weak or alpine specimens), bearing few root-fibres which break off easily, bark very thin, whitish or grey, smooth, fracture pure white, farinaceous, cambium discontinuous, forming (usually 4 or 5) isolated, slender, cylindric strands arranged in a ring; taste purely bitter; mother-tuber collapsed, deeply grooved and wrinkled, with conspicuous root-fibre scars. Innovation-bud of daughter-tuber conic, 3-8 mm. long. Stem erect, simple or branched, from 15-90 cm. (rarely to almost 2 m.) high, terete, glabrous below, finely crispo-pubescent in the upper part, lowest 2-4 (sometimes more) internodes short, the following 2-10 elongate. Leaves more or less heteromorphous,

glabrous or the upper sparingly pubescent on the nerves below; lowest on long (up to 13 cm.) petioles, blade orbicular-cordate or ovate-cordate in outline with a usually narrow sinus (1-1.5 cm. deep), 2.5-3.5 cm. high from the sinus to the tip, 3-7 (rarely to 9) cm. across, usually 5-lobed to the middle, lobes crenate or inciso-crenate, crenae rotundate, apiculate; intermediate leaves shortly petioled or sessile, ovate-cordate, often acuminate, 3.5-12 cm. long, 2.5-7.5 cm. broad, inciso-crenate or serrate or the lower ones obscurely lobed, serratures acute or apiculate; uppermost leaves similar to the preceding, amplexicaul. Inflorescence a slender raceme or a lax, leafy panicle, or in alpine specimens reduced to a few flowers, crispo-pubescent; floral leaves like the preceding infrafloral leaves, but smaller, passing upwards into the rapidly decreasing ovate or lanceolate, crenate or (the uppermost) entire bracts; bracteoles, if present, at or above the middle of the pedicel, elliptic or oblong, usually entire; pedicels erect, in the mature state often adpressed to the rhachis, lower up to 5 cm. long, upper much shorter. Sepals more or less blue or violet, rarely whitish, with dark conspicuous veins, finely pubescent or glabrous; upper sepal almost navicular obliquely erect, shortly or obscurely beaked, 18-20 mm. high, and as long from tip to base, widest (8-9 mm.) above the middle, lateral margin sinuous; lateral sepals very oblique and broadly obovate with dark tips, 14-20 mm. long, 12-20 mm. broad, not clawed; lower sepals elliptic, obtuse or subacute, 8-10 mm. long. Nectaries glabrous, extinguisher-shaped; claw erect, 16-18 mm. long, hood short (up to 4 mm.) and very wide, more or less gibbous above, lip very short and broad, obtusely 2-lobed or entire. Filaments 6-8 mm. long, glabrous or sparingly hairy, winged beyond the middle, usually abruptly contracted, rarely produced into short teeth. Carpels 5, contiguous, elliptic-oblong, shortly contracted into the slightly shorter style, crispo-pubescent with adpressed hairs. Follicles contiguous, linear-oblong, straight, 16-18 mm. long, more or less glabrescent. Seeds obpyramidal, 3-4 mm. long, blackish brown, angles acute or more or less winged, faces smooth.

Distribution: Common in the subalpine and alpine zone of the Himalaya, from the Indus to Kumaon, from 6,000 to 15,000 ft.

The root is exhibited as white, yellow, red, and black varieties; the white is the best. Bitter tonic, hot, stomachic, digestive; alleviates dysentery and bilious complaints; good in periodic and intermittent fevers as a tonic; useful in diarrhœa and vomiting of children; causes constipation when taken in large doses; useful in bites from poisonous snakes, scorpions, rates, etc. (Ayurveda).

White and dark varieties; tonic; strengthens the body; alleviates dysentery; good in piles, in bilious complaints, in plethoric conditions; removes gases from the stomach (Yunani).

The root is prescribed with other drugs for the streatment of snake-bite (Charaka, Sushruta, Vagbhata) and scorpion sting (Sushruta).

The pure roots should break with a short starchy fracture, should taste bitter without producing any acridity and tingling sensation of the tongue.

The root cured a case of acute dysentery and a case of chronic enteritis (Koman).

The drug is a good bitter and tonic, but worthless as an antiperiodic (Central Indigenous Drugs Committee). It is not an antidote to snake venom (Mhaskar and Caius) and is useless in the treatment of scorpion sting (Caius and Khaksar).

The alkaloid atisine has been obtained from the root.

Bhote: Ais—; *Bombay:* Atis, Atvika—; *Canarese:* Atibaje—; *Cutch:* Ativista—; *Gujerat:* Atavishnikali, Ativakh, Ativish—; *Hindi:* Atis, Atvika—; *Kashmir:* Hongisafed, Mohandigujsafed—; *Marathi:* Atavish—; *Persian:* Vajjeturki—; *Punjab:* Bonga, Chitijari, Patis, Patris, Sukhihari—; *Sanskrit:* Amrita, Aruna, Ataicha, Atisaraghni, Ativisha, Bhangura, Bhringi, Ghunavallabha, Kashmira, Madri, Mahoshadha, Mridvi, Prativisha, Pravisha, Shishubhaishyajja, Shokapaha, Shringi, Shringika, Shuklakanda, Shveta, Shvetakanda, Shvetavacha, Shyamkanda, Upvisha, Vira, Virupa, Visha, Visharupa, Vishva—; *Tamil:* Atividyam—; *Telugu:* Ativasa.—.

5. **Aconitum palmatum** D. Don Prodr. Fl. (1825) 196; Royle Ill. Himal. 47, 57; Hook.f. Him. Journ. I, 168; Fl. Brit. Ind. I, 28 (excl. syn.); Watt. Dict. Ec. Prod. Ind. I, 98 and in Agr. Ledg.

(1902) no. 3, 89. Dymock, Warden & Hooper Pharm. Ind. 18; Goris in Bull. Soc. Pharmacol. III (1901) 112 (excl. syn. A. lethale) fig. 29; Stapf Ind. Acon. 156, pl. 102. — *A. ferox* subsp. *palmatum* Brühl in Ann. Roy. Bot. Gard. Calc. II, 111, pl. 111, figs. 9-13, 24, 25, 31. A. sp. Dymock Mat. Med. W. Ind. ed. 1, 9, ed. 2, 6. — *Caltha Bisma* Hamilt. in Edinb. Journ. Sc. (1824) 251. —*Nirbisia Bisma* G. Don Gen. Syst. I, 63.

Roots biennial, paired, tuberous; daughter-tuber shortly conic to long-cylindric, often irregularly shaped, 4 to more than 10 cm. long, 0.75-3 cm. thick, simple or branched, sometimes flexous or twisted, bearing root-fibres, some of which are threadlike from the base and break off easily, while other are much thickened at the base or thick-cylindric, light-brown, smooth, fracture more or less horny and brownish in the thickest part of full-grown samples, almost farinaceous and white towards the tips and in the root-branches, cambium discontinuous forming isolated strands of very varying shape and size, cylindric or tangentially flattened or crescent-shaped in cross-section, taste purely and persistently bitter; mother-tubers similar, but smaller, shrunk, usually more or less hollow and brown internally. Innovation-bud short, conic from a broad base. Stem erect sometimes slightly flexuous in the upper part, simple, or nearly so, inclusive of the infloréscenc 2-4 ft. high, stout, hollow, glabrous, shiniong. Leaves scattered, rather distant, up to 10, rarely more, the lowest usually withered at the time of flowering, quite glabrous, or the uppermost finely pubescent on the nerves below; petioles slender, 4-10 cm. long; blade orbicular-cordate to reniform with a very wide sinus (1-2 cm. deep), 6-10 cm. high from the sinus to the tip, 7-15 cm. across, 5— or (the uppermost) 3-palmati-partite to $^4/_5$ or ¾, rarely more (to $^8/_9$ in the inner incisions), divisions obovate-cuneate to broadly lanceolate-cuneate or the outermost trapezoid, 3-lobed to about the middle or the outermost 2-lobed, intermediate lobe often enlongated like the others acutely inciso-dentate or apiculately creneate. Inflorescence a very loose, leafy panicles or raceme, 10-20 cm. long, glabrous, or pubescent in the upper part; rhachis rather slender; floral leaves like the preceding cauline leaves, passing into the ovate or deltoid, dentate, shortly petioled bracts; bracteoles similar to the bracts, but

smaller, and sparingly dentate or entire, above the middle of the pedicels or even close to the flower; pedicels slender, curved, ascending, ultimately more erect, the lower up to 10 cm. long. Sepals blueish or variegated white and blue, glabrous at least outside, uppermost helmet-shaped, helmet obliquely semi-orbicular (from the side) or more depressed and gaping, very shortly or obscurely beaked, 20-24 mm. high, 18-24 mm. long from the tip to the base, 10-12 mm. wide (seen from the side) lateral margin very slightly concave or almost straight; lateral sepals contiguous with the helmet, obliquely orbicular-quadrate, not clawed, 18-20 mm. long; lower sepals obliquely oblong or elliptic, obtuse to acute, 12-15 mm. long. Nectaries glabrous, extinguisher-shaped; claw erect or the upper end more or less leaning forward, 16-18 mm. long; hood subcylindric, 4-8 mm. long, oblique to almost horizontal, top gibbous posteriorly, honey-gland occupying the gibbosity or the whole top, lip extremely short, crenulate, very broad. Filaments glabrous, 8 mm. long, narrowly winged to or beyond the middle, wings gradually attenuated. Carpels 5, subcontiguous in the flower, but soon diverging, narrowly oblong, gradually passing into the shorter style, quite glabrous. Follicles subcontiguous or somewhat diverging in the upper part, oblong, obliquely truncate, 2.5-3 cm. long, 5-6 mm. broad, loosely reticulate. Seeds blackish, obovoid, about 3 mm. long, round in cross-section, obscurely winged along the rhaphe, transversely lamellate, lamellae dark, undulate.

Distribution: Alpine Himalaya of Nepal, Sikkim, and the adjoining part of South Tibet, from 10,000-16,000 ft.

The non-poisonous root is tonic and antiperiodic. It contains the alkaloid palmatisine.

Bombay: Bikhma, Vakhama—; *Gujerati:* Vakhamo—; *Hindi:* Bishawa—; *Sikkim:* Setobikhoma.—.

6. **Aconitum deinorrhizum** Stapf Ind. Acon. (1905) 158, pl. 103.—*A. ferox* Clegh. Rep. for Punj. and W. Himal. 67; Stewart Punj. Pl. 1 (partim, non Wall. ex Séringe). — *A. ferox* vars. *laciniatum* and *atrox* Watt in Agr. Ledg. (1902) no. 3, 96 and 97 (partim. — *A. atrox* and *A. Brühlii* Goris in Bull. Sc. Pharm. III (1901) 122 (partim).

Roots biennial, tuberous, paired; daughter-tuber conical, rather enlongated, up to 6.5 cm. long and at the upper end up to 18 mm. thick, with very few filiform root-fibres, brown externally, fracture scarcely farinaceous, whitish, taste indifferent followed by a strong tingling sensation, cambium discontinuous, broken up into strands arranged in a ring, the smaller circular in cross-section the larger tangentially flattened; mother-tuber similar, more or less shrunk, wrinkled, with long filiform root-fibres. Innovation-bud a very low broad obtuse cone; scales very broad with a clasping base, decaying after sprouting. Stem several feet high, erect, straight, simple, terete, sparingly and finely crispo-pubsecent in the upper part, otherwise glabrous, shining, or in young plants sparingly pubescent all along. Leaves up to 10 or 12, scattered, lower usually decayed at the time of flowering, the upper 6-8 rather distant, sparingly hairy when young, especially towards the margins and on the nerves below, soon glabrescent; petioles slender, mostly 5-7 cm. long, dilated at the base; blade reniform or ovate-reniform in outline, with a very wide sinus or an almost truncate base, 5-pedati partite almost to the base (to $^{15}/_{16}$ — $^{19}/_{20}$ in the inner, to $^{3}/_{4}$—$^{7}/_{8}$ in the outer incisions), inner divisions subequal or the intermediate distinctly longer, rhombic from a cuneate base, up to 8 cm. (or the intermediate to 10 cm. long, 5-6.5 cm. broad, 3-lobed to the middle, intermediate lobe much longer than the lateral, lobes deeply laciniate, laciniae linear or broad-lanceolate, entire or sparingly inciso-sentate, shortly acute or subobtuse, outer divisions asymmetric, usually to or beyond the middle, otherwise similar to the inner, but smaller. Inflorescence straight, racemose, simple or sometime with an additional branchlet from near its base, 30-40 cm. long, narrow, not very dense, greyish crispo-pubescent; lowest bracts similar to the preceding leaves, or like the rest much reduced, coarsely and sparingly dentate, the uppermost very small; pedicels erect, slender, lower up to 6.5 cm. long, upper much shorter; bracteoles linear, up to 4 mm. long, or on the lower pedicels broader and sparingly dentate. Sepals blue, crispo-puberulous; uppermost helmet-shaped, helmet more or less oblique, depressed, 15-20 mm. high, 17-22 mm. from the tip to the base, about 7 mm. wide (in profile), slightly concave towards the base in front and produced into

a short beak, shortly and broadly clawed; lateral oblique, suborbicular, scarcely unguiculate, ciliate, 14-18 mm. long; lower oblong, 10 mm. long, obtuse, deflexed. Nectaries hispidulous all over; claw almost straight, 12-13 mm. long; hood leaning forward, gibbous near the top on the back, 5 mm. long, lip short, broad, emarginate, reflexed. Filaments hairy in the upper part, 8-10 mm. long, winged beyond the middle, wings abruptly contracted. Carpels 3, oblong, conniving in the flower, then subdivaricate, adpressedly greyish-pubescent, contracted into the rather long style. Follicles unknown. Seeds obconic, 3 mm. long, terete with numerous small short transverse lamellae.

Distribution: Alpine Himalaya of Bashahr.

The root contains the poisonous alkaloid pseudaconitine.

Bashahr: Maura, Mohra.

7. **Aconitum balfourii** Stapf Ind. Acon. (1905) 160, pl. 104. — *A. ferox* Wall. Pl. As. Rar. I, 35 (partim); Balf. in Edinb. New Phil. Journ. XLVII (1849) 366, t. V; Bentl. & Trim. Medic. Pl. no. 5, with pl. (partim); Hook.f. & Th. in Hook.f. Fl. Brit. Ind. I, 28 (partim). — *A. ferox* var. *atrox* Brühl in Ann. Roy. Bot. Gard. Calc. V, pt. II, 110 (partim?); Watt in Agr. Ledg. (1902) no. 3, 97 (partim). — *A ferox* var. *polyschiza* ex Goris in Bull. Sc. Pharm. III (1901) 118 (partim?).

Roots biennial, paired or ternate, tuberous; daughter-tubers sometimes paired or divided from the base, conic or elongate conico-cylindric, 3-7 cm. long, 1-2 cm. thick with few root-fibres, which are either slender-filiform or conspicuously thickened (up to 5 mm. diam.) at the base, externally greyish brown, fracture white, almost horny, taste rather indifferent, followed by a tingling sensation, cambium discontinuous, broken up into strands arranged in a ring, the smaller circular in transverse section, the larger tangentially flattened to horseshoe-shaped; mother-tubers with, often, numerous root-fibres much shrunk, grooved and wrinkled with conical stumps (root-fibre bases), collapsed. Innovation-bud a much depressed, broad, obtuse cone or hemisphere, scales broad with a clasping base usually decaying after sprouting. Stem erect, several feet high, straight, robust,

simple, terete, delicately pubescent in the upper part, otherwise usually quite glabrous. Leaves scattered, 6-10, the lowest decayed at the time of flowering, intermediate and upper leaves rather distant, pubescent when young, at length glabrous, with the exception of the nerves below, lower petioles up to 7.5 cm. long, intermediate and upper much shorter, somewhat dilated at the base, blades dark green above, paler below, orbicular or ovate-cordate or subreniform, with a narrow or wide sinus, 1—2 cm. deep, 7—9 cm. from the sinus to the tip, 10—12 cm. across, 3-partite to 7/8, intermediate division rhomboid-ovate from a broad cuneate base, 3-lobed to the middle, middle lobe much longer than the lateral, lateral divisions trapezoid, very unequally 2-lobed to the middle, all the lobes coarsely inciso-crenate or dentate, crenæ apiculate or acute. Inflorescence straight, racemose, narrow, up to 30 cm. long, many-flowered, rather dense, yellowish tomentellous and slightly viscous; lowest bracts resembling the preceding leaves, following ovate or lanceolate, inciso-dentate or dentate, uppermost often entire; pedicels erect or the lower ascending, lowest up to 5 cm., upper 2.5 cm. long; bracteoles, if any, inciso-dentate or dentate, small. Sepals blue, pubescent; uppermost helmet-shaped, helmet oblique, subsemiorbicular in profile, slightly concave in front and shortly beaked, about 20 mm. high and 20 mm. from tip to base, 10—13 mm. wide, very shortly and broadly clawed, lateral sepals suboblique, orbicular or slightly broader than long, up to 16 mm. long, obscurely clawed; lower sepals elliptic or broad-oblong, obtuse, 12—14 mm. long. Nectaries glabrous, claw erect or slightly curved, 12—13 mm. long; hood leaning forward, rather wide, dorsally gibbous near the top, about 6 mm. long; lip short, broad, emarginate or crenulate. Filaments hispidulous in the upper part or almost glabrous, 6 mm. long, broadly winged to beyond the middle, wings gradually or abruptly running out. Carpels 5, oblong, yellowish tomentose, conniving in the flower, then slightly divergent. Follicles oblong, slightly divergent above, otherwise contiguous, loosely hairy or glabrate, 12 mm. long, 4.5 mm. broad. Seeds obpyramidal, trigonous, 3—3.5 mm. long, dark brown, broadly winged along the rhaphe, faces with narrow transverse lamellæ giving out towards the back.

Distribution: Subalpine and alpine Himalaya from British Garhwal to Nepal.

The tubers contain the poisonous alkaloid pseudaconitine.

Darma: Gobriya—; *Garhwal:* Banwa—; *Nepal:* Gobari—.

8. **Aconitum falconeri** Stapf in Ind. Acon. (1905) 163, pl. 105.—*A. ferox* Royle III. Bot. Himal. 47 (partim); Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I, 28 (partim).—*A. ferox* var. *atrox* Brühl in Ann. Roy. Bot. Gard Calc. V, 110 (partim), figs. 15 and (?) 23. —*A. dissectum* Royle l. c. 56 (non D. Don), Tausch et Stein.

Roots biennial, paired, tuberous; daughter-tuber conic to cylindric from a broad, truncate base, up to 8 cm. long to 2 cm. thick, entire or divided, bearing more or less numerous filiform root-fibres, externally brown, fracture white, slightly farinaceous or horny, taste somewhat bitter, followed by a strong burning and tingling sensation, cambium continuous, forming in transverse section a slightly sinuous ring; mother-tuber similar, much shrunk and wrinkled. Innovation-bud very short and broad, conic, bud-scales very short, broad and clasping, soon decaying after sprouting. Stem erect, simple, up to 1 m. high, moderately stout, finely pubescent or sub-glabrous in the upper part, quite glabrous below. Leaves scattered, 10 or more, if many, the upper sometimes rather crowded, the intermediate usualy very distant, the lowest decayed at the time of flowering; petioles slender, lowest up to 12 cm. long, upper much shorter, uppermost very short; blades rather thin, very sparingly and finely pubescent or glabrous, with the exception of the nerves at the base below, lower and intermediate rotundate-cordate to reniform in outline, with a very wide and open sinus, 1—3 cm. deep, 6—10 cm. high from the sinus to the tip, 12—15 cm. across, 5-subpedatipartite to $^6/_7$ or more in the inner, to $^3/_4$ or more in the outer incisions, inner divisions rhomboid-cuneate, 3-lobed to the middle with the inner lobe elongated and pinnatilaciniate, outer divisions much smaller, trapezoid, 2-lobed, all the lobes and laciniæ broadly inciso-dentate, teeth usually triangular; upper blades very similar, but smaller and less deeply divided or 3-partite with the intermediate division much larger than the lateral. Inflorescence an erect, stiff, usually dense raceme, about 15—20 cm. long, rarely lax and with slender, few-flowered, ascending, additional branches from below, finely adpressedly pubescent or rarely with

short spreading hairs; axis rather slender; lowest bracts 3-partite, upper ovate to deltoid, all actually and coarsely dentate; bracteoles usualy present, resembling the upper bracts, but much smaller; pedicels slender, erect, often almost adpressed to the axis, lowest up to 4 cm. long, the upper much shorter. Sepals blue with very dark tips (in the dry state), pubescent; uppermost helmet-shaped, helmet obliquely semi-orbicular in profile, very shortly heaked, 16—22 mm. high, 18—22 mm. long, from the tip to the base, 8—9 mm. wide; lateral sepals oblique, suborbicular or obovate-orbicular, 14—18 mm. long, lower sepals oblong-elliptic, obtuse, 8—10 mm. long. Nectaries extinguisher-shaped, claw erect, 13—15 mm. long, minutely hispid, hood leaning forwards or almost horizontal, slightly constricted or obscurely gibbous on the back close to the top, lip spathulate, broad, crenulate. Carpels 5, obliquely oblong, conniving in the flower, soon slightly divergent, gradually passing into the rather long style, quite glabrous and black when dry or sometimes more or less very minutely silky pubescent. Follicles erect and contiguous or slightly diverging upwards, oblong, rounded at the top, 14—18 mm. long, 4—5 mm. broad, glabrous, faintly reticulate. Seeds brown, obconic, 3—4 mm. long, winged (often broadly) along the rhaphe, with undulate, hyaline, rather wide and distant transverse lamellæ.

Distribution: Subalpine and alpine zone of the Himalaya of Garhwal.

The root is considered poisonous.

Var. *latilobum* Stapf l. c. 164.

Roots up to 12 cm. long and 2.5 cm. thick, with few fibres. Upper leaf-blades 3-partite to $^5/_6$; up to 6.5 cm. high, 10 cm. across, divisions broadly deltoid or the outer trapezoid, up to 4.5 cm. broad, shortly 3—or (the outer) 2-lobed, lobes coarsely crenate or dentate Inflorescence tomentose with spreading hairs. Carpels quite glabrous.

Distribution: Bashahr; Nagli.

9. **Aconitum spicatum** Stapf in Ind. Acon. (1905) 165, pl. 106.—*A. ferox* Hook. f. & Th. Fl. Ind. I, 56, and Hook. f. Fl. Brit. Ind. I, 28 (partim).—*A. ferox* vars. *spicata* (pro maxima parte), *heterophylloides* (partim), *laxiflora* et *crassicaulis* Brühl in Ann.

Roy. Bot. Gard. Calc. V, II, 110, pl. 111, figs. 6, 16, 21, 28, 29. —*A. ferox* var. *spicatum* Goris in Bull. Sc. Pharm. III (1901) 117, fig. 32; Watt in Agr. Ledg. (1902) nos. 3, 94.—*A. ferox* var. *crassicaulis* Watt l. c. 96.

Roots biennial, paired, tuberous, daughter-tuber conic or conic-oblong, often rather elongated, 10—20 cm. long, 1.8—3 cm. thick, simple or sometimes deeply divided, with filiform root-fibres the bases of which are sometimes abruptly thickened and persist as conical or ovoid stumps, brown or blackish externally, fracture horny, yellowish or brown in the dry state, taste slightly sweetish-bitter, followed by a tingling sensation; cambium continuous, forming in cross-section a more or less sinuous ring; mother-tuber similar, shrunk and wrinkled. Innovation-bud a very broad, much depressed cone with broad clasping scales, decaying soon after sprouting. Stem erect, up to 1.5 m. high, straight or slightly flexuous above, simple terete or sometimes slightly angular, robust, sometimes as much as 3 cm. in diam. adpressedly greyish-pubescent with deflexed hairs, glabrescent or quite glabrous in the lower part, brown or almost black when dry. Lowest 5-8 leaves decayed at the time of flowering, their scars rather distant; intermediate and upper leaves as many as 12, approximate or congested, petioled; petioles 2.5—7.5 cm. long, dilated at the base; blades somewhat fleshy, more or less finely pubescent or at length glabrous above, orbicular cordate or reniform or broadly ovate (particularly the upper) with a usually shallow sinus, 3-partite to $^4/_5$—$^6/_7$ or the upper to $^2/_3$, intermediate division rhomboid or ovate from a linear cuneate base, sometimes acuminate, 5—10 cm. long, 3—7.5 cm. broad, later divisions separated by a narrow sinus from the intermediate, broad-trapezoid, 2.5—7.5 cm. long, very unequally 2—3 partite to $^2/_3$—$^5/_6$, all the divisions much inciso-dentate or laciniate with acute dentate laciniae. Inflorescence stiff, racemose or often panicled, narrow, many-flowered, dense, rarely loose and subflexuous, more or less tomentose with spreading or deflexed hairs; lower bracts like the preceding leaves, but smaller, more elongate and less dissected, longer than the pedicels, intermediate and upper lanceolate or oblong, sparingly dentate or entire, often over 2 cm. long, pedicels erect,

rather stout, lower over 2.5 cm. long, upper much shorter; bracteoles, if any, herbaceous, rather broad and dentate, or narrow and entire to very narrow. Sepals of a saturated blue, more rarely pale or purplish blue, more or less pubescent to almost tomentose; uppermost helmet-shaped, helmet erect or slightly oblique, depressed, semi-orbicular in profile, almost equally curved in front and on the back, 20—24 mm. high, 20—24 mm. from the tip to the base, 12—15 mm. wide, produced into a very short beak, claw very short and broad; lateral sepals oblique, suborbicular, 12—18 mm. long, obscurely clawed; lower horizontal or deflexed, oblong, obtuse, 8—12 mm. long. Nectaries glabrous or scantily hispidulous, claw slightly curved or straight, 10—12, rarely to 14 mm. long, hood much leaning forward or subhorizontal, dorsally gibbous or almost spurred on the top, 6—8 mm. long, lip usually short, broad, emarginate. Filaments glabrous or sparingly hispidulous in the upper part, 7—8 mm. long, winged to or beyond the middle, wings gradually running out or suddenly contracted into small teeth. Carpels 5, oblong or ovoid, contracted into the slightly shorter style, densely tomentose. Follicles 5, oblong, somewhat turgid, contiguous, about 10 mm. long, 4—4.5 mm. broad, hairy. Seeds obpyramidal, about 4 mm. long, winged along the rhaphe with undulate hyaline transverse lamellae on the faces.

Distribution: Alpine zone of the Himalaya of Sikkim and Chumbi.

This species is the principal source of the "Bikh" or "Bish" of the Calcutta market. The toxic principle is the alkaloid bikhaconitine.

Sikkim: Bikh, Guiongmot, Shoddukmot.

10. **Aconitum laciniatum** Stapf in Ind. Acon. (1905) 168, pl. 108.—*A. ferox* var. *laciniata* Brühl in Ann. Roy. Bot. Gard. Calc. V, II, 111 (partim), pl. 111, figs. 7, 8, 17, 30; Watt in Agr. Ledg. (1902) n. 3, 96-97.

Roots biennial, tuberous, paired; daughter-tuber conic-oblong, often rather drawn out into a slender point, 3.5-6 cm. long, about 1.5—2 cm. thick, simple or divided, with filiform root-fibres, which are generally not much thickened at the base, brown externally, fracture

gibbous or almost spurred on the back close to the apex, lip short or elongate, rather broad, 2-lobed. Filaments hispidulous in the upper part, 7 mm. long, winged up to or beyond the middle, wings gradually or abruptly running out. Carpels 3, rarely 4 or 5, conniving in the flower, oblong, attenuate into a slender, finely curved style, densely and adpressedly pubescent. Follicles at first divergent, then conniving, contiguous, linear-oblong, more or less convex on the back, 18—25 mm. long, 5—6 mm. wide, finely pubescent. Seeds obpyramidal, 3-gonous, 3 mm. long, brown, broadly winged along the rhaphe, with transverse, undulate, hyaline lamellae.

Distribution: Subalpine and alpine Himalaya of Sikkim and adjoining Tibet.

One of the sources of Calcutta "Bikh." Evidently poisonous. *Sikkim:* Kalobikhmo—.

11. **Aconitum ferox** Wall. ex Séringe Mus. Helv. I (1823) 160, t. XV, figs. 43, 44; Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I, 28 (partim); Köhler Mediz. Pfl. III, 68 (partim) with pl., non aliorum; Stapf Ind. Acon. (1905) 169, pl. 109.—*A. virosum* D. Don Prodr. Fl. Nep. 196.—*A. Napellus* var. *rigidum* Hook. f. & Th. Fl. Ind. I. 29 (partim).—*A. dissectum* Stein in Gartenflora (1886) 226, fig. or p. 227 (non D. Don neque Tausch).

Roots biennial, paired, tuberous; daughter-tuber ovoid-oblong to ellipsoid, 2.5-4 cm. long, about 1-1.5 cm. thick, with few filiform root-fibres, dark brown externally, fracture scarcely farinaceous, yellowish, taste rather indifferent, followed by a strong tingling sensation, cambium continuous, forming in cross-section a slightly sinuous ring; mother-tuber much shrunk and wrinkled with more numerous root-fibres, outer sieve-strands, surrounded by a mantle of sclerenchymatic cells. Innovation-bud conic, 4-5 mm. long; scales ovate, prominently finely nerved, persistent. Stem erect, with or without a slender, hypogaeous base (up to 3 cm. long) which emits numerous fine roots near the upper end, simple, erect, 40—90 cm. high, rather slender, covered with short spreading yellow hairs in the upper part, glabrous below, hollow. Leaves scattered, distant, excepting the lowest 2 or 3 which are usually decayed at the time of flowering, up to 7, glabrous or the uppermost very sparingly hairy; petioles

slender, the lower up to 25 cm. long and much dilated at the base, uppermost very short; blade orbicular-cordate to reniform in outline with a rather wide sinus (up to 8 cm. deep), up to 11 cm. high from the sinus to the tip, up to 20 cm. across, 5-pedatipartite to the very base or almost so in the inner, and to $^8/_9$—$^9/_{10}$ in the outer incisions, divisions deltoid from a cuneate base or the outermost trapezoid, intermediate division 3-lobed to the middle, middle lobe elongate, pinnatilaciniate to inciso-dentate, ultimate segments or teeth acute or very acute, inner lateral divisions similar, but less symmetric, outermost 2-lobed or 2-partite, all laciniae more or less linear-lanceolate and divaricate, the outermost often overlapping and thus closing the sinus; uppermost blades sessile or subsessile, much smaller and less dissected. Inflorescence a loose raceme, 10-25 cm. long, often with slender, erect, few-flowered additional branches from the leafy base; rhachis slender, densely yellow-pubescent to subtomentose; floral leaves like the preceding leaves, but much reduced, passing upwards into the trifid or entire and linear-lanceolate bracts; bracteoles at or below the middle, resembling reduced bracts, very often suppressed; pedicels slender, erect, the lowest at length up to 7 cm. long. Sepals blue, hairy; uppermost helmet-shaped, helmet semiorbicular in profile, shortly beaked 20-24 mm. high, 17—20 mm. from the tip to the base, 7—9 mm. wide; lateral sepals, slightly continguous with the helmet, oblique, orbicular-obovate, broadly clawed, 16 mm. long, 14 mm. broad; lower sepals deflexed, oblong, subacute, 10 mm. long. Nectaries glabrous; claw erect; hood oblique to subhorizontal, oblong, gibbous or the back from the middle upwards or near the top; lip deflexed, lanceolate, acute, entire. Filaments glabrous, about 7 mm. long, narrowly winged, wings gradually attenuate. Carpels 5, conniving and contiguous, tomentose, gradually passing into the style. Follicles oblong, obliquely subtruncate, 15—20 mm. long, 4—5 mm. broad, dorsally subconvex, loosely tomentose or at length almost glabrous, conspicuously reticulate. Seeds obovoid to obpyramidal, 2.6—3 mm. long, winged along the rhaphe, transversely lamellate on the faces, lamellae undulate.

Distribution: Alpine Himalaya of Nepal.

The root is treated with urine or milk from the cow, or with cowdung for three or more days; the urine, milk or dung being renewed every day. Very sweet, hot; removes "vata" and "kapha"; alleviates inflammatory throat complaints, and fevers; stimulates the secretion of bile; a general remover of internal inflammations, *i.e.*, of the lungs, intestines, joints, etc. (Ayurveda).

Eighteen varieties of which ten are very poisonous. Used in leprosy, and inflammatory complaints of the throat and lungs (Yunani).

Recommended, either alone or in combination with other drugs, for the treatment of snake-bite (Vagbhata, Bhavaprakasha, Yogaratnakara, Tanjore Pills) and scorpion-sting (Vagbhata, Yogaratnakara, Nighantaratnakara, Brihannighantaratnakara, Subodhavaidyaka, Vrindamadhava, Baishajyaratnavali, Chakradatta, Ashtangasangraha).

It is a very effective medicine in various diseases, acting as a narcotic sedative, regarded as heating and stimulant, useful in fever, cephalalgia, affections of the throat, dyspepsia, and rheumatism. It is much used as an external application, the root being formed into a paste and spread upon the skin in neuralgia, boils, etc. Internally, it is chiefly used in the treatment of chronic intermittent fevers.

The drug is chiefly employed in India in the treatment of leprosy, fever, cholera, and rheumatism.

A preparation of the root is much used in all the hilly districts in India to poison arrows. The toxic principle is the alkaloid pseudaconitine.

Tincture of Aconite at first slows the heart rate, lowers the blood pressure, and increases the peripheral circulation, later the heart-rate is accelerated and the blood pressure raised. After treatment of the root with cow's urine the tincture increases the rate and systole of the heart, the blood pressure, and the peripheral circulation; and the effects persist for a very long time (K. C. Bose; Mhaskar and Caius). If the root is treated with cow's milk, instead of urine, the above changes are much more pronounced (Mhaskar and Caius).

The crude root contains about 1.4 per cent of total alkaloids,

whereas the root treated with cow's urine contains only 1.27 per cent. Treatment with cow's urine and exposure to sunlight have brought about a partial change of the toxic alkaloids aconitine and pseudaconitine into the far less poisonous substances benzoyl-aconine and veratroyl-aconine (K. C. Bose).

The root is not an antidote to snake venom (Mhaskar and Caius) and is useless in the treatment of scorpion sting (Caius and Mhaskar).

"The so-called ferox variety, known as the India Aconite, has been shown to be a mixture of *A. deinorrhizum* and *A. balfoureii* of deinorrhizum type of Stapf. Two other varieties are often found mixed in it, *i.e.*, *A. spicatum* and *A. laciniatum* belonging to the napellus type of Stapf" (Chopra, Gupta and Ghosh).

Arabic: Bish—; *Assam:* Bish—; *Bengal:* Bish, Butsnabbish, Katbish—; *Bombay:* Butchnab—; *Canarese:* Vasanabhi, Vatsanabhi—; *Cutch:* Buchnaga—; *Gujerat:* Shingadiovachnag, Vachhanag, Vachnag—; *Hindi:* Bachhnag, Bachnak, Bis, Bish, Mahoor, Mithazahar, Singya, Singyabis, Teliyabis—; *Lepcha:* Nyine—; *Malayalam:* Vatsanabhi—; *Marathi:* Bachnag, Vachnag—; *Nepal:* Atisingeeabish, Bikh, Bish, Bishnak—; *Persian:* Bishnag, Zher—; *Sanskrit:* Aheya, Amrita, Bhugara, Brahmaputra, Darada, Gara, Garada, Garala, Ghora, Halahala, Haridra, Jangala, Jangula, Jivanaghata, Kakola, Kalakuta, Kasakula, Kishala, Kshveda, Nila, Pradipana, Pranahara, Raktashringika, Rasa, Rasayana, Shanklakeya, Shringi, Sowrashtrika, Tikshna, Vatsanabha, Visha—; *Sinhalese:* Vachanabhi—; *Tamil:* Vashanavi—; *Telugu:* Ativasa, Nabhi, Vasanabhi—.

12. **Aconitum elwesii** Stapf. in Ind. Acon. (1905) 174, pl. 112A.—*A. variegatum* Hook. f. Himal. Journ. II, 107 (non Linn.).—*A. uncinatum* (?) Hook. f. Fl. Brit. Ind. I, 28 (non Linn.).

Roots unknown. Stem scandent, branched, flexuous, slender, terete, crispo-pubescent from adpressed reversed hairs. Basal leaves unknown; intermediate and upper scattered, petioled; petioles flexuous, up to 3 cm. long; blades pubescent, ultimately glabrate, cordate-ovate or rotundate in outline, with a wide sinus, 0.5-1.5 cm. deep, up to more than 5 cm. long from the sinus to the tip, 4-6 cm. across,

3-partite to $^7/_8$—$^9/_{10}$, intermediate division rhomboid, acuminate up to 2.5 cm. wide, lateral divisions trapezoid, up to 3.5 cm. long, unequally 2-lobed to the middle, all coarsely crenate, crenae apiculate. Inflorescence axillary and terminal, racemose or subpaniculate, pendulous or nodding, few- to many-flowered, loose, pubescent; lower and intermediate bracts representing reduced leaves, uppermost lanceolate or linear, entire, shorter than the pedicels; pedicels recurved, the lowest at length up to 5 cm. long; bracteoles linear or those of the lowest pedicels more or less dissected or lobed. Flowers erect (negatively geotropous). Sepals blue or violet, sparingly pubescent; uppermost helmet-shaped, helmet broadly semielliptic in profile or almost semiorbicular, suboblique, 20-25 mm. high, 17-20 mm. from the tip to the base, 10-13 mm. broad, slightly concave or suddenly contracted in front, shortly beaked; lateral sepals suborbicular, suboblique, 14-16 mm. long, long-ciliate, not clawed; lower deflexed, oblong, obtuse, 10-13 mm. long. Nectaries glabrous; claw slightly curved, 12-15 mm. long; hood suberect, recurved, spurred, 5 mm. long, lip rather long, slightly 2-lobed. Filaments 6 mm. long, winged up to or beyond the middle, wings more or less abruptly contracted. Carpels 5, conniving, glabrous, obliquely oblong, passing into a slender style, at length up to 4 mm. long. Follicles (immature) 5, divergent, oblong, up to 12 mm. long, 3 mm. broad. Seed unknown.

Distribution: Alpine Himalaya of N.-E. Sikkim.

The root is reputed poisonous.

13. **Aconitum lethale** Griff. Not. IV, 732; Ic. Pl. As. DCLX. fig. III; Stapf Ind. Acon. (1905) 175, pl. 112B.—*A. palmatum* Hook. f. Fl. Brit. Ind. I, 28 (the Mishmi plant, non Wall.).

Roots fusiform, whitish or brown, bearing root-fibres. Stem scandent (?), branched, flexuous, slender, terete, glabrous or the uppermost part pubescent from minute adpressed reversed hairs. Basal leaves unknown; intermediate and upper leaves scattered, petioled; petioles slender up to 5 cm. long; blades shining, bright green above, pale below, glabrous or scantily pubescent on the nerves below, cordate-rotundate in outline with a wide sinus or reniform, 3-partite

to $^5/_6$ (or the small leaves of the branches 5-lobed to the middle), intermediate divisions narrow, obovate-cuneate, almost 5 cm. long, up to 1.8 cm. broad, lateral divisions trapezoid, up to 3.5 cm. long, unequally divaricate-2-lobed to the middle, all coarsely dentate, teeth apiculate. Inflorescence loosely racemose (?), slightly pubsecent; bracts foliaceous, 3-lobed, lobes sparingly dentate; pedicels slender, 3.5-7.5 cm. long; bracteoles foliaceous, 3-partite, divisions dentate, up to 12 mm. long, or more or less reduced, near the flower. Sepals blue (?), slightly pubescent; uppermost helmet-shaped, helmet semiorbicular-elliptic in profile, 18-20 mm. high, 18-20 mm. from the tip to the base, 12 mm. broad; lateral oblique, orbicular-obovate, shortly and broadly clawed, up to 16 mm. long, 10-12 mm. broad; lower deflexed, broad elliptic, subobtuse, up to 16 mm. long. Nectaries glabrous, claw erect, 12-14 mm. long; hood erect, oblong, very shortly spurred from the top, 6 mm. long, lip broad, 2-lobed. Filaments glabrous 8-9 mm. long, winged to or beyond the middle, wings gradually or suddenly contracted. Carpels 5, obliquely oblong, sparingly pubescent.

Distribution: Higher parts of the Mishmi mountains.

The root contains the non-poisonous alkaloid palmatisine. It is, however, believed to be the source of the celebrated "Bhi" or "Bis" poison of the Mishmis (Griffith).

DILLENIACEAE.

Trees or shrubs. Leaves alternate, with sheathing petioles, exstipulate, or rarely with lateral, deciduous stipules. Flowers yellow or white. Sepals 5, imbricate, persistent. Petals 5 or fewer, deciduous. Stamens numerous, hypogynous, many-seriate; anthers innate, dehiscing by lateral slits or terminal pores. Carpels 1 or more, free or cohering in the axis; ovules amphitropous, solitary or few and ascending, or many and attached to the ventral

suture; styles distinct. Fruit follicular, or indehiscent and subbaccate. Seeds 1, or many, arillate (except Dillenia); testa crustaceous; rhaphe short; albumen fleshy; embryo minute, next the hilum.—Genera 16. Species 400.—Tropical and subtropical regions.

Therapeutically the Order is of no practical importance.

Dillenia Linn.

Trees. Leaves large, with parallel nerves. Flowers handsome, lateral, solitary or fascicled. Sepals 5, spreading. Petals 5, usualy large. Stamens nearly free; anthers linear, the inner erect or recurved, introrse, the outer recurved, extrorse. Carpels 5-20, cohering in the axis, many-ovuled, indehiscent, when ripe united into a globose fruit enveloped in the sepals. Seeds not, or sometimes immersed in pulp, exarillate.—Species 20.—Indo-Malayan.

In Indo China the calyces of *D. baillonii* Pierre, *D. indica* Linn., and *D. ovata* Wall. are made into jellies and cooling drinks; the bark of *D. ovata* Wall. is used medicinally in Cambodia.

1. **Dillenia indica** Linn. Sp. Pl. (1753) 535.—*D. speciosa* Thunb. in Trans. Linn. Soc. I (1791) 200; Wight Ic. t. 823.—Plate 24.

A middle-sized tree; trunk straight but not high; branches spreading, forming a round, shady head. Leaves fascicled at the ends of the branches, oblong-lanceolate, acuminate, 20-30 by about 10 cm., sharply serrate, the nerves close, running into the serratures, not forking at the margins, upper surface and the nerves beneath more or less pubescent; petioles 2.5—5 cm. long, channelled, sheathing. Flowers often exceeding 15 cm. diam., white, fragrant, appearing with the leaves, usualy solitary towards the end of each branchlet; pedicels about 7.5 cm. long, clavate, round, smooth. Sepals, orbicular, concave, thick and fleshy. Petals oblong. Stamens many, the inner larger, and arching over the shorter outer ones. Fruit large, 7.5-10 cm. diam., hard outside, fleshy within. Seeds many, imbedded in glutinous pulp, compressed, with hairy margins.

Distribution: From Nepal to Assam and south to Ceylon, Malay Peninsula.—Indo-China, Malaya.

The raw fruit is sour, bitter, pungent. The ripe fruit sweet, sour, tasty; removes "vata" and "kapha"; dispels fatigue; stops abdominal pains (Ayurveda).

The juice of the fruit, mixed with sugar and water, is used as a cooling beverage in fevers, and as a cough mixture. The fruit is slightly laxative, and is apt to induce diarrhœa if too freely indulged in.

The bark and the leaves are astringent.

Assam: Chalita, Otengah—; *Bengal:* Chalta, Hargesa—; *Bombay:* Karambel, Mothakarmel, Mothekaramala—; *Burma:* Thabyu, Thibuta, Zinbrun, Zinpyunngan—; *Canarese:* Bettakanigala, Kadkanagula, Kanigala, Neyitaku—; *Garo:* Panpui—; *Gujerat:* Karmbal, Otaphal—; *Hindi:* Chalta, Girnar—; *Indo-China:* Dok shan, So ba—; *Kachin:* Masang—; *Konkani:* Corombol—; *Lepcha:* Kyangmozhu, Phamsikol—; *Magahi:* Chauralesi, Thapru—; *Malay:* Chimpuh, Simpoh—; *Malayalam:* Chalita, Punna, Syalita, Valapunna—; *Marathi:* Karmbel, Motakarmal, Motakarmbal—; *Monghyr:* Chilta—; *Mundari:* Korkotadaru—; *Nepal:* Panchkule, Panchphal, Ramphal—! *Sanskrit:* Bhavya, Ruvya—; *Santal:* Korkot—; *Sinhalese:* Hondapara, Wampara—; *Taleing:* Carllow—; *Tamil:* Akku, Ugakkay, Uva, Uvav, Uvatteku—; *Telugu:* Kalinga, Peddakalinga, Uvva—; *Uriya:* Chalota, Ou, Rai, Uau—.

MAGNOLIACEAE.

Trees or shrubs, sometimes climbing, often aromatic. Leaves alternate, entire or rarely toothed, usually stipulate. Flowers axillary and terminal, sometimes unisexual, white yellow or red, often showy and fragrant. Sepals and petals similar, hypogynous, very deciduous, arranged in whorls of 3. Stamens very numerous

or rarely as few as 5, hypogynous; filaments free or monadelphous; anthers adnate, dehiscing longitudinally. Carpels indefinite, free or cohering to an elongated axis or in one whorl; styles usually short; ovules 2 or more on the ventral suture. Fruit baccate, follicular or of woody dehiscent carpels which are sometimes arranged in a cone.—Genera 7. Species 70.—Tropical and subtropical regions.

1. Stipules conspicuous. Gynophore stalked .... MICHELIA.
2 Stipules absent. Carpels in 1 whorl .... ILLICIUM.

Bitter, aromatic, astringent, tonic, stimulant, diaphoretic, and antiperiodic properties prevail throughout the Order.

Many members yield essential oils.

Among the products isolated the following may be mentioned:—(1) cyanogenetic glucosides and saponins; (2) crystalline compounds of alkaloidal (?) nature—tulipiferine—; (3) bitter principles—liriodendrin, magnolin, shikimin—; (4) toxic principles—sikimitoxin—; (5) tannins and resins—; (6) mucilage.

OFFICIAL:—*Drimys Winteri* Forst. var. *granatensis* (France).

Illicium anisatum Lour.=*I. religiosum* Sieb. (Portugal); *I. verum* Hook. (Austria, Russia),—Hook. fil. (France, Germany, Great Britain, Italy, Spain, Sweden, Switzerland, United States)= *I. anisatum Loureiro* (Hungary).

MICHELIA Linn.

Trees. Leaf-buds enveloped in convolute deciduous stipules which are conate in pairs. Sepals and petals similar, concolorous, 9 or more, 3-or more-seriate, imbricate. Stamens numerous, many-seriate; anthers linear, adnate, introrse. Gynophore stipitate. Carpels many, persistent, 2-valved, arranged in a lax or elongate spike, dehiscing dorsally; ovules 2, or more. Seeds pendulous by a long funicle.—Species 15.—Tropical Asia, China.

1. Leaves 15—25 cm. long. Flowers yellow. Sepals and petals 15 or more .... 1. *M. champaca.*
2. Leaves 5—10 cm. long. Flowers white or with a tinge of yellow. Sepals and petals 9—12 .... 2. *M. nilagirica.*
3. Leaves up to 19 cm. long. Flowers white. Sepals and petals 8 3. *M. montana.*

The barks are bitter and aromatic, stimulant and antiperiodic.

The following are used medicinally in Indo-China—*M. champaca* Linn.; in Malaya and Java—*M. champaca* Linn., *M. montana* Blum.

1. **Michelia champaca** Linn. Sp. Pl. (1753) 536; King Ann. Roy. Bot. Gard. Calc. III, 216, t. 64; Brandis For. Fl. t. 1.—PLATE 26.

A tall, handsome, evergreen tree with a straight trunk; branches ascending, spreading, forming a close head. Leaves 15-25 by 5-9 cm., lanceolate, acute or acuminate, entire, glabrous above (except when young), glabrous or more or less pubescent beneath; petioles 18-25 mm. long. Flowers about 5-6.2 cm. diam., very fragrant, axillary, solitary, each enclosed in bud by a greyish yellow pubescent, spathaceous, coriaceous, deciduous bract. Sepals and petals 15 or more, deep yellow or orange; the outer oblong, acute; the inner linear; pedicels 6 mm. long, stout, wrinkled, marked with an anular scar round the middle. Capsules 18 mm., dark brown, opening on the back by two valves, valves woody, orbicular, covered with white warty excrescences. Seeds 1-12, brown, polished, variously angled, rounded on the back.

Distribution: Wild in the E. sub-Himalayan tract and lower hills up to 3,000 ft., Assam, Burma, W. Ghats, S. India. Much cultivated in various parts of India and Burma.—Yunnan, Indo-China, Siam, Malaya (not in Malay Peninsula).

The bark is bitter with a sharp acrid taste; causes warmth in the abdomen; destroys poisons; removes worms; facilitates micturition; diuretic, diaphoretic, aphrodisiac; removes "kapha" and "vata", bile and blood affections. The leaves in combination with other drugs remove the foetid odour of vaginal discharges. The flowers are bitter, stomachic, diuretic; they remove bilious conditions; good in leprosy, skin diseases, and ulcers (Ayurveda).

The flowers and the fruit in combination with other drugs are recommended as an antidote to snake and scorpion venoms (Sushruta).

The smell of the flowers is a good stimulant. The flowers are expectorant and useful in cough and rheumatism (Yunani).

The dried root and root-bark, mixed with curdled milk, is useful as an application to abscesses, clearing away or maturing the inflammation. In the form of an infusion it is a valuable emmenagogue (Rheede). It is also considered purgative.

The bark has febrifugal properties; it is a stimulant, expectorant, and astringent.

In Dacca the juice of the leaves is given with honey in cases of colic (Taylor).

The flowers and fruits are considered bitter and cool remedies, and are used in dyspepsia, nausea, and fever. The flowers mixed with sesamum oil form an external application, which is often prescribed in vertigo; they are also applied to foetid discharges from the nostrils (Taylor). They are useful as a diuretic in renal diseases and in gonorrhœa (Rumph). They are considered stimulant, antispasmodic, tonic, stomachic, and carminative.

The perfumed oil prepared from the flowers is a useful application in cephalalgia, ophthalmia, and gout (Rheede).

The seeds and fruit are said to be useful for healing cracks in the feet.

A decoction of the bark was tried in sixteen mild cases of chronic gastristis. After using it for several days the patients obtained considerable relief from the pain and discomfort in the epigastrium with which they were troubled, but none of the cases was completely cured (Koman).

The flower and the fruit are useless in the antidotal and symptomatic treatment of snake bite (Mhaskar and Caius) and scorpion sting (Caius and Mhaskar).

Annam: Dam bac, Su Nam—; *Assam:* Phulchopa, Phulsopa, Titasoppa—; *Bengal:* Champa, Champaka, Chumpa—; *Bombay:* Champa, Chapha—; *Burma:* Changal, Paranyam, Saga—; *Canarese:* Champaka, Kendasampige, Kolasampige, Sampige—; *Deccan:* Champa—; *English:* Golden Champa, Yellow Champa—; *French:* Champac—; *Gujerati:* Champo, Pitochampo, Raechampo, Sonchampa—; *Hindi:* Champ, Champa, Champac, Champaca—; *Indo-China:* Kim cuong moc—; *Kathiawar:* Pilochampo, Rayachampo, Sachochampo—; *Konkani:* Champa, Champo, Pudchampo—; *La Reunion:* Champac—;

Malay: Bongasjampacca, Mangliet—; *Malayalam:* Champakam—; *Marathi:* Kudchampa, Pivalachampa, Sonachampa—; *Mundari:* Campabadaru—; *Nepal:* Aulechamp, Oulichamp—; *North-Western Provinces:* Champa—; *Philippines:* Champaca, Champaga—; *Portuguese:* Champo—; *Punjab:* Chamba, Chamoti, Champa, Chamuti—; *Sadani:* Campa—; *Sanskrit:* Anjana, Atigandhaka, Bhramaratithi, Bhringmohi, Chambunala, Champaka, Champeya, Deepapushpa, Gandhaphali, Hemanga, Hemapushpa, Hemapushpaka, Hemavha, Kamabana, Kanchana, Katu, Kumara, Kusuma, Kusumadhipa, Kusumadhirata, Nagapushpa, Patichampaka, Peetapushpa, Punyagandha, Rajachampaka, Shatapadatithi, Shitala, Shitalachchada, Sthiragandha, Sthirpushpa, Subhaga, Sukumara, Surabhi, Svarnachampaka, Svarnapushpa, Ugragandha, Vanadapika, Vanadeepa, Vanamalika, Varalabdha—; *Sinhalese:* Champak, Hapu, Sapu—; *Tagalog:* Champaga, Sampac, Sampaka, Tsampaka—; *Tamil:* Amariyam, Sambagam, Sembagam, Shampangi, Vandumarmalar—; *Telugu:* Champakmu, Champeyamu, Gandhaphali, Gangaravi, Hemangamu, Hemapushpamu, Kanjanamu, Sampangi, Sampega—; *Tulu:* Champaka, Sampay—; *Uriya:* Chompa, Chompoko—.

2. **Michelia nilagirica** Zenk. Pl. Ind. 21, t. 20; Wight Ic. t. 938; King Ann. Roy. Bot. Gard. Calc. III, 216, t. 65; Fyson Fl. Nilg. & Puln. I (1915) 11, t. 8.—*M. Pulneyensis* Wight. III. I, 14, t. 5 (exc. figs. 5 & 6).—Plate 27.

Stem white; twigs erect; buds long, silky, leaves elliptic, acuminate, entire, hard, glabrous and shiny, flat or drooping. Flowers white or a pale cream colour, of 9-12 oblong or obovate, easily crushed and quickly fading sepals and petals. Stamens numerous with very short swollen bases and slender anthers of 12 mm. with small tips. Fruiting torus erect, 7.5-10 cm.; carpels covered with white warts and opening by a slit beginning on the outer side. Seeds 2, red, the outer coat soft with a mango smell, inner hard; completely filling the carpel, and attached close together, the upper with its micropyle just above or to one side of the hilum, the lower with it just below; funicle at first remarkably elastic.

Distribution: Shola forests of the Nilgiris, Anamalais and Pulneys above 5,000 ft.

The bark is used as a febrifuge.

Canarese: Bilisampage, Doddasampage, Sampana, Sapage—; *Hindi:* Pilachampa—; *Marathi:* Pilachampa—; *Sinhalese:* Walsapu—; *Tamil:* Kattuchambagam, Nilagirishambagam, Shambagam—.

3. **Michelia montana** Bl. in Verh. Bat. Gen. IX, 153; Bl. Fl. Jav. Magnol. 15, t. 5; King in Ann. Roy Bot. Gard. Calc. III (2), 218, t. 68; Ridley Fl. Mal. Penins. I (1922) 15.

A glabrous tree, 6-9 m. tall. Leaves thinly coriaceous, obovate, narrowed at both ends, dark green; nerves 12 pairs, 15—19 cm. long, 10 cm. broad, petioles 18 mm. long. Flowers white, fragrant, 3.8 cm. across, solitary axillary or terminal peduncle 12 mm. long. Sepals and petals 8, oblanceolate or lanceolate-acute. Stamens 18-24. Pistils 3-4. Follicles usually 1, subglobular-pyriform, woody, 7.5 cm. long, walls 12 mm. thick. Seeds 4 or 5.

Distribution: Himalaya, Malay Peninsula.—Java.

The bark is a bitter tonic useful in fevers.

Illicium Linn.

Evergreen aromatic shrubs or small trees. Leaves quite entire, pellucid-dotted. Flowers 2-sexual, solitary or fascicled, yellow or purplish. Sepals 3-6. Petals 9 or more, 3—many-seriate. Stamens indefinite, fiilaments thick; anthers adnate, introrse. Ovaries indefinite, 1-seriate, 1-ovuled; style subulate, recurved. Fruit of spreading compressed hard follicles. Seeds compressed, testa hard, shining, albumen fleshy.—Species 20.—India, China, Japan, Atlantic N. America.

The fruits are aromatic, stimulant, and carminative.

The following species are used medicinally in China—*I. anisatum* Linn.—; in Indo-China—*I. anisatum* Linn. *I. griffithii* Hook. f. & Th., *I. verum* Hook. f.—; in Malaya—*I. verum* Hook. f.—; in the Philippine Islands—*I. anisatum* Linn.—; in North America—*I. floridanum* Ell., *I. parviflorum* Michx.—.

Sikimitoxin, a highly toxic substance, has been isolated from *I. anisatum*.

OFFICIAL:—The fruit of *Illicium anisatum* Lour.=*Illicium religiosum* Sieb. (Portugal); *I. verum* Hook. (Austria, Russia),—Hook. f. (France, Italy).

The oil from *I. verum* Hook. f. (France, Germany, Great Britain, Spain, Sweden, Switzerland, United States)=*I. anisatum* Loureiro (Hungary).

1. **Illicium griffithii** Hook. f. & Th. Fl. Ind. (1855) 74.—Pl. 25.

A shrub. Branches angular, glabrous. Leaves elliptic-lanceolate, 5-10 by 2.5-5 cm., acute at both ends, coriaceous, shining. Flowers 3.8 cm. diam., Perianth-segments about 24. Sepals 6, orbicular, Petals 18, outer oval, inner smaller, narrow. Carpels with a thin fleshy pericarp, woody endocarp, and short subulate incurved beak.

Distribution: Bhutan, Khasia Hills, 4,000—5,000 ft.

Star-anise is aromatic, stimulant, and carminative.

French: Faux badianier—; *Indo-China:* Dai hoi nui—.

ANNONACEÆ.

Trees or shrubs often climbing and frequently aromatic. Leaves alternate, simple, entire, exstipulate. Flowers 2- or 1-sexual. Sepals 3 or rarely 2, free or connate. Petals 6, usually thick and fleshy, generally biseriate, hypogynous, valvate or slightly imbricate, the inner sometimes absent. Stamens usually many; filaments short or 0; anthers adnate; connective produced into an oblong or truncate head. Carpels numerous or rarely few or solitary, distinct or rarely coherent; styles short or 0; ovlules one or more. Fruit of 1 or more, sessile or stalked, 1- or many-seeded, usually indehiscent carpels or rarely of several coherent carpels.—Genera 80. Species 820.—Chiefly tropical, especially of the Old World.

A. Petals 2 in 2 rows, one or both rows imbricate in bud. Stamens many. Asther-cells concealed by a flat appendage.
   1. Sepals imbricate. Trees or shrubs. Ovules 6-8. Torus flat .. SAGERAEA.
   2. Sepals valvate. Climbers. Ovules many .... UVARIA.
B. Petals valvate in bud, flat, or base only concave. Inner petals similar to outer. Stamens many, with overlapping appendages. Ovaries indefinite, rarely few.
   1. Petals connivent at concave base, covering stamens and ovaries. Climbers with hooked peduncles. Flowers rather large .... ARTABOTRYS.
   2. Petals flat. Carpels indehiscent.
      a. Trees. Ovules many in 2 rows. Stamen-appendages acute .... CANANGIUM.
      b. Trees. Ovules 1-2 .... POLYALTHIA.
C. Petals valvate, thick, connivent; outer long narrow or broad, inner small but similar. Ovules solitary. Fruit fleshy of many connate carpels .... ANNONA.

The seeds are insecticidal; the barks aromatic, stimulant, cathartic, and antiperiodic.

The alkaloid artabotrine has been isolated from *Artabotrys suaveolens* Bl.

UVARIA Linn.

Scandent or sarmentose shrubs, stellately pubescent or tomentose. Inflorescence terminal or leaf-opposed, rarely axillary; flowers hermaphrodite. Sepals 3, often connate at the base, broad, valvate. Petals 6, orbicular, ovate or oblong, imbricate in 2 series, sometimes connate at the base. Stamens indefinite; connective produced beyond the cells, subfoliaceous or truncate. Torus depressed, pubescent or tomentose. Ovaries indefinite, linear-oblong; ovules many, 2-seriate; style short, thick. Ripe carpels numerous, dry or berried, few-or many-seeded.—Species 100—Tropics of the Old World.

1. Stamens all cuneate .... 1. *U. Narum.*
2. Outer stamens flat .... 2. *U. dulcis.*

The genus exhibits tonic, stimulant, alterative, febrifugal, anthelmintic, and vulnerary properties.

U. calamistrata Hance. is used medicinally in Indo-China, and *U. chamae* P. Beauv. in the Gold Coast.

1. **Uvaria narum** Bl. Pl. Java Anon. (1828) 5; Wight 111, I, t. 6; King in Ann. Roy. Gard. Calc. IV, 27, t. 21.—PLATE 28.

A large climber. Leaves 5-15 by 2.5-3.8 cm., oblong-lanceolate, acute or acuminate, glabrous on both surfaces, reticulately veined; petioles short, less than 6 mm. long. Flowers reddish, 2.5 cm. diam., solitary, terminal; pedicels 2.5—3.8 cm. long. Sepals orbicular-ovate, connate at the base, reflexed, minutely stellately tomentose. Petals usually 6, sometimes 7-8, ovate or oblong, connate at the base. Connective of anthers produced at the apex, broad, truncate. Carpels 9-18 mm. long, and about 8 mm. diam., numerous, scarlet, glabrous, slightly torulose, on slender stalks 9-18 mm. long. Seeds chestnut-brown, suborbicular, in a single row, usually 4-5, those at the ends of the carpels plano-convex, the intermediate ones compressed, nearly flat.

Distribution: Bombay Presidency: Konkan, N. Kanara, Madras Presidency: Forests of the W. Ghats from S. Kanara to Travancore, hills of Salem up to 4,000 ft.

The oil obtained from the roots by distillation, as well as the root, are used medicinally in various diseases. The root is fragrant and aromatic, and the bruised leaves smell like cinnamon (Rheede).

Canarese: Kariballi, Unamini—; *Malayalam:* Narampanal—; *Tamil:* Pulichan—; *Tulu:* Pandel—.

2. **Uvaria dulcis** Dunal Anonac. 90, t. 13; King in Ann. Roy. Bot. Gard. Calc. IV, 18, t. 8.

A big liane, 24—30 m. long; young branches ashy-tomentose. Leaves coriaceous, elliptic or oval-acute, base rounded, minutely cordate, above stellate-pubescent, 11—18 cm. long, 6—8.7 cm. wide; petioles 5 mm. long, stout. Peduncles 12 mm. long, lateral 1-flowered, 1 to 3 together. Bracts ovate, deciduous; buds ovoid-globose, woolly. Flowers 3—3.8 cm. across, pale yellow. Sepals broadly triangular, tomentose. Petals broadly ovate, subacute, tomentose above, pubescent beneath. Stamens numerous, appendages large, oblique. Ovaries numerous, tomentose. Torus depressed-hemispheric, tomentose. Carpels numerous, oblong-ovoid, obtuse, tuberculate and stellate-tomentose; stalks 2.5 cm. long.

Distribution: Burma, Malay Peninsula.—Java.

The bark of the root has astringent, stimulant, and alterative properties.

Malay: Pisang-pisang hitam—; *Visayan:* Dalaganum, Dalagao—.

Artabotrys R. Br.

Shrubs, usually sarmentose or scandent. Flowers solitary or fascicled, often fragrant, usually on woody, hooked, recurved branches (peduncles). Sepals 3, valvate, cohering at the base. Petals 6, biseriate, valvate, concave at the base, constricted around the organs, again spreading. Stamens indefinite, oblong or cuneate; connective truncate or produced; anther-cells dorsal. Torus flat or convex. Ovaries many or few; ovules 2, erect, collateral; style oblong or columnar. Ripe carpels berried.—Species 30.—Palaeotropics.

1. Limb of petals broad, lanceolate or elliptic-oblong .... 1. *A. odoratissimus.*
2. Limb of outer or all the peatls linear, narrow-oblong, or subclavate .... 2. *A. suaveolens.*

A. odoratissimus R. Br. is used medicinally in Indo China, the Philippine Islands, the Malay Archipelago; *A. suaveolens* Bl. in Java.

1. **Artabotrys odoratissimus** R. Br. in Bot. Reg. (1820) t. 423.

A shrub, often scandent. Leaves up to 18 by 3.8-5 cm., oblong-lanceolate, shortly acuminate, glabrous, shining, acute at the base; petioles 6-10 mm. long. Flowers yellow, solitary or in pairs, 3.2-3.8 cm. long; pedicels 2 cm. long. Sepals 6 mm. long, connate below, ovate, acute, tips reflexed. Petals lanceolate above the saccate base, clothed with appressed silky hairs. Ripe carpels 6-10, obovoid, glabrous, 2-3.8 cm. long, by 2.2 cm. diam., yellow. Seeds oblong, a little flattened, deeply grooved on one side, more than 13 mm. long.

Distribution: Native probably of S. India and Ceylon, Java, China.—Largely cultivated in India.

The flower is acrid, bitter; heating, alexiteric; useful in vomiting, biliousness, diseases of the blood and the heart, itch, sweats,

foul breath, thirst, leucoderma, headache, diseases of the bladder, erysipelas (Ayurveda).

A decoction of the leaves is given for cholera in some of the islands of the Malay Archipelago.

Bombay: Vilayatichampa—; *Canarese:* Kandalisampage, Manoranjanballi—; *Deccan:* Madanmast, Madmanti—; *Indo-China:* Day cong chua—; *Malayalam:* Madanakameswari, Manoranjitam—; *Philippines:* Ilang-ilang de China—; *Sanskrit:* Harachampaka, Nilachampaka, Phalasampenga—; *Tagalog:* Alagalag sonson, Alangilang sonson—; *Tamil:* Manoranjidam—; *Telugu:* Manoranjidamu, Muddasampenga, Phalasampanga, Sakalaphalasampanga—; *Uriya:* Kalomuro, Monasocompa—.

2. **Artabotrys suaveolens** Bl. Fl. Jav. Anon. 62, t. 30, 31D; Hook. f. Fl. Brit. Ind. I, 55; Ann. Bot. Gard. Calc. IV, 46. pl. 61.

A tall climber 15 m. or more long; stem black, usually glabrous except the petals, occasionally puberulous on the underside of the leaves and peduncles. Leaves thinly coriaceous dark shining green oblong-lanceolate to ovate-lanceolate-acute shortly acuminate, base acute 9 cm. long; petioles short. Peduncles thin hooked at first, thickening strongly as they age, glabrous or puberulous, with 5-15 flowers on pedicels, 7.5-11 mm. long. Flowers 10 mm. long, white creamy, tomentose. Sepals ovate acute, 2.5 mm. long. Petals dilate at base, limb cylindric or clubbed erect, tips incurved. Anthers brown, appendages broad oblique. Carpels few, ellipsoid, obtuse, base narrowed, glabrous, 10-13 mm. long, 6 mm. through. Seed 1, ellipsoid, testa granular.

Distribution: Sylhet, Chittagong, Mergui, Malay Paninsula.—Malay Islands.

The Malays use the leaves to prepare an aromatic infusion whose good effects have been extolled in the treatment of cholera (Blume).

An alkaloid, artabotrine, has been isolated (*Phil. Journ. Sc.;* 1929).

Malay: Akar chenana, Durie carban—.

CANANGIUM Baill.

Tall trees with large membranous leaves. Flowers large or small, solitary or fascicled in short axillary cymes. Sepals 3, ovate-valvate. Petals 6, thin, subequal, green or yellow, long, flat, valvate. Stamens linear; anther-cells approximate, extrorse; appendages lanceolate-acute. Pistils many; stigmas subcapitate; ovules numerous in 2 rows. Carpels many, juicy, stalked. Seeds many, testa black, crustaceous pitted, sending spinous processes into the albumen.—Species 3.—Burma to New Guinea and Philippines.

The genus may be considered to be therapeutically inert.

1. **Canangium odoratum** Baill. Hist. des Plant. I, 213.—*Cananga odorata* Hook. f. & Th. Fl. Ind. (1855) 130.—*Uvaria odorata* Lamb. 111. t. 495, f. 1; Bl. Fl. Jav. Anon. t. 9.

A tall tree; trunk straight, bark smooth, ashy; shoots glabrous. Leaves 12-20 by 5-7 cm., ovate-oblong, finely acuminate, puberulous beneath, chiefly on the veins, base rounded, margins waved; petiole about 1 cm. long. Flowers 7.5 cm. long, usually 3-nate, drooping, yellow, odorous. Peduncles solitary or several from old scars; pedicels 2.5 cm., recurved, hairy, with a few basal and a median scaly bract. Petals 7.5 cm. long, subequal, narrow-linear, base broad, silky when young. Carpels about 12, glabrous, long-stalked, 12-16 mm. long, ovoid or obovoid, black, 6-12-seeded.

Distribution: Ava, Tenasserim, cultivated throughout India.—Java.

The flowers yield the "ilang-ilang" of perfumes. "Cananga Oil" consists of the early portions of the distillate.

The oil is used as an application in cephalalgia, ophthalmia, and gout.

Burma: Kadapnyan, Kadatnyan—; *Canarese:* Apurvachampaka—; *French:* Bois de Bananen, Bois de lance bâtard, Caneng aromatique—; *Ilocano:* Alangilang, Ilangilang—; *Jolo:* Angilang—; *Malay:* Cananga, Ilangilang, Kenanga—; *Sinhalese:* Wanasapu—; *Tagalog:* Alangilang, Ilangilang—; *Tamil:* Karumugai, Maladi, Maramanoranjidam, Sadi, Sirusambagam—; *Telugu:* Apurvachampakamu—; *Visayan:* Alangilang, Ilangilang—.

ANNONA Linn.

Trees or shrubs. Peduncles 1-flowered; flowers terminal or leaf-opposed. Sepals 3, small, valvate. Petals usually 6, valvate, in 2 series, the exterior fleshy, concave at base, the inner subsimilar or smaller, rarely wanting. Stamens many, the produced connective ovoid at top. Ovaries many, often connate; ovule 1, erect; style oblong. Ripe carpels confluent in a multilocular, ovoid or globose, many-seeded fruit.—Species 70.—Tropical especially American.

1 Fruit tubercled .... 1. *A. squamosa.*
2. Fruit smooth, slightly areolate .... 2. *A. reticulata.*
3. Fruit bearing numerous fleshy spines .... 3. *A. muricata.*

The poisonous seeds are insecticidal; the bark and root are cathartic.

The following species are used medicinally in Guinea and the Gold Coast—*A. muricata* Linn., *A. senegalensis* Pers.—; in Indo-China—*A. muricata* Linn., *A. squamosa* Linn.—; in the Philippine Islands—*A. muricata* Linn., *A. reticulata* Linn., *A. squamosa* Linn.—; in North America—*A. muricata* Linn., *A. palustris* Linn., *A. spinescens* Mart., *A. squamosa* Linn.—; in Brazil—*A. cherimolia* Mill., *A. marcgravii* Mart., *A. muricata* Linn., *A. palustris* Linn., *A. pisonis* Mart., *A. reticulata* Linn., *A. spinescens* Mart., *A. squamosa* Linn.—; in Guiana—*A. ambotay* Aubl.—.

1. **Annona squamosa** Linn. Sp. Pl. (1753) 537; Bl. Fl. Jav. Anon. 107, t. 53. B.—PLATES 30 and 30A.

A tree about 6 m. high. Leaves 3.8-7.6—by 1.8-3.7 cm., oblong-lanceolate or elliptic, obtuse or subacute, pellucido-punctate, glabrous above, glaucous and pubescent beneath when young; lateral nerves 8-11 pairs; petioles 12 mm. long. Flowers solitary, leaf-opposed, or 2-4, on short, extra-axillary branchlets; pedicels 12—19 mm. long, bracteate below the middle. Sepals minute, triangular, pubescent. Petals pubescent on both surfaces; the exterior about 25 by 6 mm.; the interior minute or sometimes wanting. Fruit globose, 5-10 cm. diam., usually with a glaucous bloom on the surface when young, yellowish green when ripe, easily broken into large pieces; areoles

well-marked, granulate or tuberculate, 5-6-gonous. Seeds brownish black, smooth.

Distribution: A native of the W. Indies. Now cultivated throughout India.

Fruit sweet, tasty; good tonic, enriches the blood, increases muscular strength; cooling, lessens burning sensation; sedative to the heart; lessens tendency to biliousness; relieves vomiting (Ayurveda).

Root cathartic. Fruit sweet, flavorous; enriches the blood; stimulant, expectorant. Seeds difficult to digest; cause fever and furunculosis; abortifacient; produce ulcers in the eye; good to destroy lice in hair (Yunani).

The root is considered a drastic purgative, and is administered in acute dysentery. It is also employed internally in depression of spirits and spinal diseases (T. N. Mukharji).

The astringent bark is used as an antidiarrhœic cure in Cambodia.

In the West Indies and in Central and South America the root is used as a drastic cathartic.

An infusion of the leaves is considered efficacious in prolapsus ani of children; and the bruised leaves with salt make a cataplasm to induce suppuration.

In Brazil they are applied as a poultice over boils and ulcers. In the West Indies and in Central and South America they are used to kill lice.

The ripe fruit is medicinally considered a maturant, and when bruised and mixed with salt, is applied to malignant tumours to hasten suppuration. The seeds contain an acrid principle fatal to insects, and the dried unripe fruit, powdered and mixed with gram flour, is used to destroy vermin.

In Chota Nagpur the seeds are crushed and used for destroying worms in the wounds of cattle.

The seeds are a powerful irritant of the conjunctiva. Lt.-Col. Kirtikar, while in charge of the Thana Central Prison, came across a case in which a Life-Convict used the seed powder in destroying the cornea of both eyes to produce blindness for the purpose of avoiding being sent to the Andamans to undergo his sentence there.

Annam: Mak khieb, Mang cau ta, Qua na, Tiep—; *Antilles:* Cachimant, Hattier, Pomme-canelle—; *Arabic:* Saripha—; *Assam:* Ata, Katal—; *Bengal:* Ata, Luna; Meba—; *Brazil:* Ata, Pinha, Frutta de Condessa—; *Burma:* Auza—; *Canarese:* Amritaphala, Duranji, Sitaphala—; *Ceylon:* Anoda—; *Cuba:* Anon—; *Deccan:* At, Sitaphul—; *English:* Custard Apple, Sugar Apple, Sweet Sop—; *Ewe:* Yevunyikleng—; *Fanti:* Apre—; *French:* Anone écailleuse, Ate, Attier, Cachiman, Guanabane, Hattier, Marie baise, Pomme canelle—; *Ga:* Ngawyei, Nangwi, Ngaasie—; *Gujerati:* Anan, Anuram, Sitaphal—; *Hasada:* Sarupa—; *Hindi:* At, Atasitaphal, Shariphal, Sitaphal—; *Indo-China:* Phan le chi—; *Konkani:* At, Ath—; *Krobo:* Hangbue—; *Lambadi:* Sitaphal—; *La Reunion:* Attier—; *Malay:* Mannapapuwa, Srikaya—; *Malayalam:* Antacheecha, Attachchakka, Sirpa, Sitapalam, Sutakanni—; *Marathi:* At, Sitaphal—; *Mexico:* Anona—; *Mundari:* Borordaru, Neoa, Sampa—; *Nagpuri:* Neoa—; *Nepal:* Shariphal—; *North-Western Provinces:* Behli, Sharifa—; *Persian:* Kaj, Sharifah—; *Portuguese:* Ateira, Fructa de Conde—; *Puerto Rico:* Anon, Anona con escamas, Atis—; *Sakalave:* Konkony—; *Sanskrit.* Agrimakhya, Atripya, Bahubijaka, Gandagatra, Krishnabija, Sitaphala, Subha, Suda, Vaidehivallabha—; *Santal:* Mandargom—; *Sinhalese:* Anoda, Atta—; *Sumatra:* Sirikayu—; *Tagalog:* Ates—; *Tamil:* Atta, Sitapalam—; *Telugu:* Gandagatramu, Sitapandu, Sitaphalamu—; *Tulu:* Amritakay—; *Twi:* Apre, Bororfo, Nyankongma—; *Uriya:* Ato, Sitapholo—.

2. **Annona reticulate** Linn. Sp. Pl. (1753) 537.

A small tree; young branches tomentose, the older glabrous. Leaves membranous, 10-18 by 2.5-4.4 cm., oblong-lanceolate, acute or obtuse, cuneate or rounded at the base, minutely pellucido-punctate, the upper surface glabrous, the lower with a few scattered hairs; nerves 15-18 pairs; petioles 6-19 mm. long. Flowers 2-4, on lateral pedicels; pedicels about 12 mm. long, elongating and becoming thick and woody in fruit. Sepals small, 4.5 mm. long, broadly ovate, acute, tomentose. Petals: the exterior 31 mm. long by 6 mm. broad, tomentose on both surfaces; the interior minute, shorter than the sepals. Fruit 10-15 cm. diam., subglobose or somewhat heart-

shaped, roughish outside, yellow or yellowish red when ripe; areoles pentagonal, lightly marked. Seeds smooth, blackish. Differs from *Annona squamosa* in the larger fruit, the areoles of which are not so distinctly marked as in that species, in the larger and more pointed leaves, and in the greater number of nerves.

Distribution: West Indies. Cultivated in India.

The fruit is astringent, sweet, useful in blood complaints. It alleviates biliousness and thirst, and aggravates "vata" and "kapha" (Ayurveda).

The bark is a powerful astringent, and is used as a tonic by the Malays.

In Brazil the leaves are used as a maturant.

In the West Indies and in Central and South America the fruit is much used as an antidysenteric and an anthelmintic.

Antilles: Cachimen, Coeur de boeuf, Corossol réticulé, Mamilier—; *Bengal:* Luvuni, Nona—; *Bombay:* Ramphal—; *Burma:* Awza—; *Canarese:* Ramaphala—; *Ceylon:* Anona—; *Cuba:* Anona, Mamon—; *Deccan:* Ramphal—; *English:* Bullock's Heart, Custard Apple, Netted Custard Apple—; *French:* Anone en réseau, Mamilier—; *Goa:* Anona—; *Gujerati:* Ramphal—; *Hayti:* Guanabano—; *Hindi:* Luvuni, Nona, Ramphal—; *Hova:* Voankobohobo—; *Konkani:* Anon—; *La Reunion:* Anone, Coeur de boeuf—; *Malay:* Manua, Nona, Nona Kapri—; *Malayalam:* Manilanilam, Parankichchakka, Ramachchita—; *Marathi:* Ramphal—; *Mexico:* Anona, Ilama—; *Philippines:* Anonas—; *Portuguese:* Anona—; *Puerto Rico:* Anona de redecilla, Corazon—; *Sakalave:* Hobohobo—; *Sanskrit:* Krishnabija, Lavali, Lavani, Mriduphala, Raktatvatch, Ramawhaya, Ramphala, Vasanta—; *Santal:* Gom—; *Seychelles:* Coeur de boeuf—; *Sinhalese:* Anoda—; *Tamil:* Aninuna, Ramachita, Manilayatta—; *Telugu:* Ramaphalamu, Ramasitaphalamu—; *Uriya:* Neua, Ramopholo, Ramositapholo—; *Venezuela:* Rinon—.

3. **Annona muricata** Linn. Sp. Pl. (1753) 536.

A small evergreen tree. Leaves leathery, ill-smelling, obovate-oblong or oblanceolate, to ovate or elliptic, acute or abruptly

acuminate, glossy above and rusty beneath, but at length glabrous, with the minute pockets in the axils of the lateral veins scarcely perceptible without a lens. Flowers large, the exterior petals thick and fleshy, ovate-acute, valvate or edge-to-edge, the interior petals somewhat smaller and thinner, concave, rounded, imbricate or overlapping. Fruit very large, fleshy, ovoid or heart-shaped, dark green, the glabrous ill-smelling skin bearing numerous recurved fleshy spines, pulp white and juicy, pleasantly subacid, with a slight mango-like flavour.

Distribution: A native of tropical America, now common in the tropics of the Old World.

The seeds are emetic and astringent.

In Brazil the leaves are steeped in hot water or ground with oil, and used as a maturant.

In La Reunion the root is considered antispasmodic and parasiticidal; the leaves are given in fevers, and also used in the form of a poultice to produce suppuration; the flower buds and the flowers are considered an excellent remedy for cough; the unripe fruits when dried and powdered are given in chronic dysentery, and they are used for aphthae in the form of a decoction; the seeds are valued for their astringent and emetic properties.

Akim: Abrorfontunkum—; *Antillas:* Anona de puntitas—; *Antilles:* Annone en bouclier, Cachiman epineuse, Corossol montagne, Grand corossol, Sapadille—; *Canarese:* Mulluramphala—; *Cartagena:* Anona de broquel, Catuche, Guanabana—; *English:* Sour Sop—; *Ewe:* Vo, Voti, Votsi—; *Fanti:* Apre—; *French:* Corrossolier—; *Fula:* Dukumeporto—; *Ga:* Aluguntungung, Nikrangmrobe—; *Indo-China:* Mak khieb thet, Mang cau xiem, Tiep parang—; *Krepi:* Yevunyakle—; *Krobo:* Alukutum—; *La Reunion:* Corossol—; *Malayalam:* Mullanjakka, Vilattinuna—; *Mexico:* Anona, Anona amarilla, Cabeza de negro, Catuche, Guanabana—; *Philippines:* Goyabrano, Guanabano—; *Sakalave:* Kaoraosaly—; *Sinhalese:* Katuanoda—; *Tamil:* Mulluchitta, Pulippala—; *Twi:* Aduatungnkungm, Apare, Deboo, Nkrangmrobe—.

SAGERAEA Dalz.

Trees, leaves smooth, shining. Branches glabrous. Flowers small, terminal, axillary, or fascicled on woody tubercles, 1-2-sexual, Sepals 3, orbicular or ovate, imbricate. Petals 6, imbricate in 2 series; nearly equal, usually orbicular and concave. Stamens 6-21, imbricate in 2 or more series, broadly oblong, thick, fleshy; anther-cells oblong; connectives produced, not hiding the anthers. Ovaries 3-6; style short, stigma obtuse or capitate; ovules 1-8 on the ventral suture. Ripe carpels stalked, globose.—Species. 6.—Indo-Malayan.

The genus has no therapeutical importance.

1. **Sageraea laurifolia** (Grah.) Blatter in Journ. Bomb. Nat. Hist. Soc. XXXIV (1930) 294.—*Guatteria laurifolia* Grah. Cat. Bomb. Pl. (1839) 4.—*Bocagea Dalzellii* Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I (1875) 92 (partim).—PLATE 32 (under *Bocagea Dalzellii* Hook. f. & Th.).

A middle sized, laurel-like tree. Leaves alternate, linear-oblong, entire, glabrous, short-petioled, upper surface shining. Flowers pedicelled, fasciculate (3 or 5) in the axils of leaves, white; pedicels with scaly, obtuse bracts at the base. Sepals 3. Petals 6, free, in 2 series, subequal, thick, fleshy, orbicular, concave, imbricate. Stamens 12, in 2 series. No filaments. Anthers bilocular, lobes linear adnate to a stout, fleshy, truncate, scale-like connective, dehiscing longitudinally. Ovaries 3-5, linear, oblong, sessile on the top of a convex torus, 1-locular; ovules 10, 2-seriate, horizontal, inserted on the ventral suture. Stigmas sessile, obtuse, emarginate. Carpels globose, glabrous, 6-seeded, the size of a cherry.

Distribution: S. Konkan.

The leaves have a pungent, astringent, and bitter taste. In the Konkan they are used for fomentation.

Bombay: Andi—; *Canarese:* Sagare—; *Konkani:* Sageree—; *Marathi:* Harkinjal, Sageri, Undie—.

POLYALTHIA Blume.

Trees or shrubs. Flowers solitary or fasciled, axillary or leaf-opposed. Sepals 3, valvate or slightly imbricate. Petals 6, valvate, 2-seriate, flat, subequal, ovate or narrow. Stamens many, cuneate; connective truncately dilated beyond the cells. Ovaries indefinite; ovules 1-2, basal and erect or subbasal and ascending; style usually oblong. Ripe carpels berried, globose or oblong, stalked, 1-seeded.—Species 70.—Palaeotropical countries.

1. Leaves narrow, lanceolate, undulate .... 1. *P. longifolia.*
2. Leaves oblong .... 2. *P. simiarum.*

The bark is a bitter tonic.

P. thorelii Fin. and Ganep. is used medicinally in Indo-China.

1. **Polyalthia longifolia** Benth. & Hook. f. ex Fl. Brit. Ind. I (1875) 62; Wight Ic. t. 1; King in Ann. Roy. Bot. Gard. Calc. IV. pt. 1 (1893) 72 and pt. 2, t. 99.—PLATE 29.

A tall handsome tree; young branches slender, glabrous. Leaves membranous, 7.5-23 by 1.8-3.8 cm., narrowly lanceolate, tapering to a fine point, shining, both surfaces glabrous, margins undulate; petioles about 6 mm. long. Flowers 2.5-3.8 cm. across, yellowish green, in fascicles or shortly peduncled umbels; pedicels slender, 2.5-3.8 cm. long, with a small, pubescent, deciduous bract about or above the middle. Sepals 4 mm. long, triangular, pubescent, the tips reflexed. Petals subequal, linear, spreading, tapering to a point. Ripe carpels 18 mm. long, numerous, stalked, ovoid, obtuse at both ends, glabrous; stalk 12 mm. long, stout, glabrous. Seeds smooth, shining.

Distribution: Ceylon.—Cultivated throughout the hotter parts of India.

The bark is used as a febrifuge in the Balasore District of Orissa (Ṣir W. W. Hunter).

Bengal: Debdaru, Devadar, Devadaru—; *Bombay:* Asok, Asoka, Asopalav, Asupal, Asupala, Devadaru—; *Canarese:* Putrajivi—; *Ceylon:* Maraillupai—; *English:* Indian Fir, Mast Tree—; *Gujerati:* Ashopalo—; *Hindi:* Asok, Debdari, Deodar, Devadar, Devadaru, Devidari—; *Konkani:* Assok, Devandaru—; *Madras:* Nettilingam—;

Malayalam: Aranei, Aruna, Ashokam, Ashvattam, Chorani, Hemapushpam, Vanjolam—; *Sanskrit:* Devadaru, Putrajiva—; *Tamil:* Asogam, Asuvattai, Kalgoli, Kasubam, Kolikkudi, Nettilingu, Pundi, Ravadam, Saribam, Selai, Sendu, Tevadaram, Vansulam—; *Telugu:* Asokamu, Asvattamu, Devadaru—; *Tulu:* Asoka—; *Uriya:* Debodaru, Asoka, Oswottho, Putikashto—.

2. **Polyalthia simiarum** Benth. & Hook. f. ex Fl. Brit. Ind. I (1875) 63.

A tall tree, the shoots puberulous or slightly pubescent; bark about 2.5 cm. thick, greenish grey, rather smooth, longitudinally fissured, spongy within, brownish grey. Leaves oblong or ovate-oblong, on short glabrous or puberulous petioles, apiculate or shortly acuminate, rounded or obtuse at base, 18—25.5 cm. long, glabrous or slightly puberulous along the nerves beneath. Peduncles laterally arising from the branches, tomentose, shortened. Flowers nearly 5 cm. diam., greenish yellow or purplish inside, on 3.8-5 cm. long, shortly tomentose or puberulous pedicels, furnished with a deciduous small bract below their middle. Petals linear-oblong to oblong-spatulate, blunt or nearly so, glabrous or puberulous; torus tawny tomentose. Berries the size of a plum, on long stalks thickened upwards, oblong, glossy, orange-red, turning bluish black, smooth.

Distribution: Orissa; Burma: Pegu Yoma, Martaban, Tenasserim.

The bark is used as a cure for scorpion stings in Orissa (Haines).

Modesia: Khari—; *Nepal:* Khutti, Labshi—; *Orissa:* Mongai, Wojarh—; *Santali:* Dighibentia—.

MENISPERMACEÆ.

Scandent or twining shrubs. Leaves alternate, usually palminerved, entire or lobed, exstipulate. Flowers dioecious, small or

minute, fascicled, panicled or racemose, rarely solitary. Sepals usually 6 (rarely 1-4 or 9-12), imbricate in 2-4 series, the outer often minute. Male Flowers: Stamens hypogynous, equal in number and opposite to the petals; filaments free or connate; anthers various, usually adnate, extrorse or lateral. Female flowers: Staminodes 6 or 0. Ovaries 3 (rarely 1 or 6-12); ovules solitary, usually amphitropous; styles usually recurved, simple or lobed. Ripe carpels drupaceous; style-scar subterminal or, by excentric growth, subbasal. Seeds usually hooked or reniform, often curved round an intrusion of the endocarp; albumen even, or ruminate, or 0; cotyledons flat or semiterete, foliaceous or fleshy, appressed or spreading.—Genera 65. Species 350.—Chiefly in the tropics of the Old and New World.

A. Flowers trimerous. Ovaries usually 3. Drupes with a subterminal, rarely ventral or basal style-scar. Seeds oblong or subglobose.
   1. Sepals 6. Stamens 6 or 3, often connate .... JATRORRHIZA.
   2. Sepals 6. Petals 6. Filaments free .... TINOSPORA.
   3. Sepals 6. Filaments all connate .... ANAMIRTA.
   4. Sepals 9. Outer Filaments free .... COSCINIUM.

B. Flowers trimerous. Ovaries usually 3. Drupe with a subbasal, rarely subterminal style-scar. Seed horseshoe-shaped. Albumen copious. Embryo slender, cotyledons linear or slightly dilated.
   1. Petals 6, minute. Ovaries 3-12. Style subulate .... TILIACORA.
   2. Petals 6. Ovaries 3-6. Styles subulate .... COCCULUS.
   3. Petals 6. Ovaries 3. Styles forked .... PERICAMPYLUS.

C. Flowers 3-5-merous. Ovaries usually solitary. Drupe with a subbasal style-scar; endocarp dorsally muricate or echinate. Seeds horseshoe-shaped. Embryo linear, cotyledons appressed.
   1. Sepals 6-10, free. Petals of male flower and female 3-5, free .. STEPHANIA.
   2. Sepals 4, free. Petals of male 4, connate, of female 1 ...... CISSAMPELOS.

D. Flowers usually trimerous. Ovaries usually 3. Drupes with a subbasal or ventral style-scar. Seed curved, hooked or inflexed.
   Sepals, petals and stamens 6 each .... PACHYGONE.

The roots are bitter, stomachic, astringent, and tonic, or acrid and diuretic. The fruits, more or less poisonous, are often narcotic.

Many members figure among the poisonous plants used in making arrow and dart poisons.

The following are among the products isolated:—(1) alkaloids-bebeerine, isobebeerine, beta-bebeerine, berberine, buxine, chondro-

line, tiliacorine—; (2) quaternary bases, none of which has been obtained in a free state—columbamin, jatrorrhizin, palmatin—; (3) crystalline bitter principles—anamyrtin, columbin, picrotoxin, picrotoxinin, trilobin—; (4) acids—columbic, picrotoxic—.

OFFICIAL:—*Chasmanthera palmata* H. Bn. (France). *Cissampelos Pareira* Linn. (Portugal). *Iatrorrhiza Calumba* Miers. (Austria). *Jateorhiza Calumba* Miers. (Holland); *J. Calumba* Miers.=Chasmanthera palmata H. Bn. (Spain); *J. Columba* Miers.= *Cocculus palmatus* De Cand. (Portugal); *J. Columba* Miers.=*J. palmata* Miers., *Cocculus palmatus* DC. (Italy); *J. Miersii* Oliv.= *Cocculus palmatus* Hook. non De Cand. (Portugal); *J. palmata* Miers. (Belgium, Norway); *Jateorrhiza palmata* (Lamarck) Miers. (Great Britain, United States); *Jatrorrhiza palmata* Miers. (Denmark, Hungary, Japan, Norway, Sweden); *J. palmata* (Lamarck) Miers. (Germany, Russia, Switzerland, Turkey).

TINOSPORA Miers.

Climbing shrubs. Flowers in racemes or rarely panicles, axillary or terminal or from the old wood. Sepals 6, in two series, the inner larger. Petals 6, smaller. Male flowers; Stamens 6, free; anthers bursting longitudinally. Female flowers: Staminodes 6, clavate; ovaries 3; stigmas forked. Drupes ventrally flat, dorsally convex, round or oval; endocarp rugose or tubercled, dorsally keeled, ventrally concave.—Species 25.—In most palaeotropical regions, but chiefly in Indo-Malaya.

I. Endocarp distinctly tuberculate.
  1. Leaves pilose on both sides or at least beneath .... 1. *T. malabarica*. ..
  2. Leaves glabrous .... 2. *T. crispa*.
II. Endocarp rotund-ovoid, ribbed on the back, otherwise almost smooth .... 3. *T. cordifolia*.

The genus is bitter, tonic, diuretic, and antiperiodic.

The following species are used medicinally in Senegal—*T. bakis* Miers.—; in Indo China—*T. cordifolia* Miers., *T. crispa* Miers., *T. malabarica* Miers.—; in the Philippine Islands—*T. crispa* Miers.—; in Java—*T. rumphii* Boerl—.

1. ***Tinospora malabarica*** (Lam.) Miers. in Ann. Hist. Nat. 2, ser. VII (1851) 38.—*T. tomentosa* (Coleb.) Miers. l. c. 3, ser. XIII (1864) 319.—*Pee-amerdu* Rheede Hort. Mal. VII (1688) t. 19.—PLATE 33. (under *T. tomentosa* Miers).

A large climber; stems about 2 cm. diam., old branches smooth and shining, with light coloured papery bark more or less warty; young parts clothed with whitish hairs. Leaves membranous or papyraceous, sparingly pubescent above, pilose below, sometimes whitish tomentose, broadly ovate-cordate or rotundate-cordate, sometimes obsoletely angular, acuminate, 7.5-23 cm. long and broad, 5-7-nerved; petioles 6-12 cm. long, striate. Pseudo-racemes often arising from the old branches, pedunculate, simple, up to 15 cm. long. Male flowers: Pedicels fasciculate, about 3-5 mm. long; sepals 6, yellowish green, the outer ones minute, thin, 1-1.4 mm. long, the inner membranous, 3-5 mm. long, 2-5 mm. broad; petals membranous, clawed at base, obliquely rhomboid-ovate, acute, above the claw with the margin slightly inflexed, about 2 mm. long, 1-3 mm. broad; stamens 3 mm. long, filaments slightly dilated towards apex. Female flowers not seen. Drupes 1-3, scarlet or orange, smooth, on thick stalks; endocarp with many sharp-pointed tubercles.

Distribution: Bengal, Khasia, Assam, Orissa, Konkan, Kanara, nearly all districts of Madras Presidency, Ceylon.

The plant has tonic properties.

In China and Tongking the fresh leaves and the stem are used in the treatment of chronic rheumatism.

The whole plant is used medicinally in Cambodia. Fumigations are recommended in piles and ulcerated wounds. In liver complaints it is used to medicate the bath.

Almora: Gurch—; *Annam:* Khoan can dang—; *Bengal:* Padmagaluncha—; *Cambodia:* Kambaur—; *Ceylon:* Bukinda, Walkinda—; *Garhwal:* Gileh—; *Hindi:* Giloe, Gulancha, Gurch—; *Marathi:* Gulvel—; *Ramnagar:* Gurja—; *Tamil:* Potchindil—; *Tongking:* Day dau xuong—; *Uriya:* Guduchi, Gulochi, Podmogulochi—.

2. **Tinospora crispa** Miers Contrib. Bot. III (1874) 34.—

Menispermum verrucosum Fleming in As. Res. XI (1810) 171; Roxb. Fl. Ind. III (1832) 808.—PLATE 34.

Climber with fawn colour, papery, warted bark. Leaves ovate to oblong-ovate, acuminate, base truncate or very slightly cordate, thin, light green, 7.5-9 cm. long, 7.5-0.4 cm. wide; petioles 9 cm. long. Raceme slender, lax. Flowers small, green. Males: Sepals 3, outer smaller, 3 inner elliptic, much larger. Petals very small, involute, oblong ovate. Stamens short, 6. Females: Pistils 3, subcylindric. Fruit oblong, 7.5 mm. long, yellow or red. Seed smooth.

Distribution: Sylhet, Assam, Burma, cultivated in Malay Peninsula and Ceylon.—Malay Archipelago.

The whole plant is exceedingly bitter, and is employed by the Malays in the cure of intermittent fevers.

In Indo China the stem is considered a febrifuge of great importance. As a tonic it is said to give as good results as quinine. There is a widespread opinion that it is an excellent tonic during convalescence from exhausting diseases.

In the Philippine Islands it is considered to be a panacea to be applied to all bodily afflictions. It is given in general debility, in chronic rheumatism, in malarial fevers.

The jungle tribes of the Malay Peninsula use the plant in the preparation of their arrow and dart poisons.

Annam: Day Ki nin, Day than thong—; *Cambodia:* Bandaul pech, Bora phet—; *French:* Liane-quinine—; *Malay:* Toba, Tuba, Tubabidyi—; *Sinhalese:* Tithakinda—; *Sunda Islands:* Andawali—; *Tagalog:* Macabuhai—; *Tongking:* Thuoc sot ret—; *Visayan:* Paliavan, Panavan, Pangiavan—. The Indian names are the same as for *T. cordifolia.*

3. **Tinospora cordifolia** Miers in Ann. Hist. Nat. 2. ser. VII (1851) 38.—*Menispermum cordifolium* Willd. Sp. Pl. IV (1805) 826; Roxb. Fl. Ind. III (1832) 811.—*Cit-amerdu* Rheede Hort. Mal. VII (1688) t. 21.—PLATE 35.

A large glabrous climber with succulent, corky, grooved stems; branches sending down slender pendulous fleshy roots, terete, striate,

with tubercled, pale, sometimes shining or glaucous bark. Leaves membranous, 7-9-nerved, 5-10 cm. or rarely 12 by 10 cm., roundish or subdeltoid, cordate with a broad sinus and large basal lobes, obtuse or more or less cuspidate, reticulately veined with microscopic glistening glands beneath; petiole 2.5-7 cm. long. Racemes rather lax, 5 cm. long, elongating and finally often longer than the leaves, axillary, terminal or from the old wood. Male flowers clustered in the axils of small subulate bracts. Sepals: The 3 outer very small, ovate-oblong, acute, the 3 inner larger, membranous, broadly elliptical, concave, 3-4 mm., yellow. Petals 6, equal, about 2 mm. long, broadly spathulate, each loosely embracing a stamen when young, claw cuneate, lamina triquetrous or subtrilobed, reflexed at apex. Pistillode 0. Female flowers usually solitary, similar to male, but sepals green, margins not reflexed, staminodes short, linear. Carpels 1-3, widely separated on the short fleshy gynophore, dorsally convex, ventrally flat or nearly so, scarlet, size of a large pea; style-scar subterminal. Stone broadly ellipsoid, with a slender dorsal ridge and a ventral depression, slightly muricate.

Distribution: Throughout tropical India, Burma, Andamans, Ceylon.

The stem is a bitter stomachic; stimulates bile secretion; causes constipation; tonic; allays thirst, fever, burning sensation, vomiting; diuretic; enriches the blood; cures jaundice; useful in skin diseases; the juice is useful in diabetes, vaginal and urethral discharges, low fevers, and enlarged spleen (Ayurveda).

Stem bitter; appetiser, stomachic, tonic, antipyretic, expectorant; good in cough, jaundice, giddiness, vomiting, piles, anæmia, chronic fever; renews the blood; mixed with sesame oil it is useful for massaging the body (Yunani).

The root and stem are prescribed in combination with other drugs as an antidote to snake-bite (Charaka, Sushruta, Vagbhata, Sharangdharasamhita, Vaidyavinoda, Yogaratnakara) and scorpion-sting (Sushruta).

An infusion of the powdered stem is used as an alterative and tonic and has enjoyed the reputation among ancient Hindu writers of being an aphrodisiac.

Among the Mundas of Chota Nagpur the whole plant, well ground, is applied on fractures.

In Ceylon the stems are used in fevers, skin diseases, jaundice, and syphilis.

The starch obtained from the roots and stems of the plant is similar to Arrow-root in appearance and effect. It answers not only as a remedial medicinal agent in chronic diarrhœa and some forms of obstinate chronic dysentery, but it is also a valuable nutrient, when there is intestinal irritability and inability to digest any kind of food. I have myself had experience of the usefulness of this starch. I think this drug is useful where there is an acid diarrhœa, due to an acidity of the intestinal canal or acid dyspepsia. It is useful in relieving the symptoms of rheumatism. There is another preparation of this plant, the *succus* (juice), freshly prepared from the fresh plant. It acts as a powerful diuretic. It is prescribed by ancient Hindu physicians in gonorrhœa with advantage (Kirtikar).

In certain parts of India the plant is regarded as a specific for the bites of poisonous insects and venomous snakes. The juice and decoction of the root are applied to the part bitten, poured frequently into the eyes and administered internally by mouth at intervals of half an hour.

A tincture was tried in mild cases of malaria and was found to be useless in such cases. The aqueous extract was tried in the low chronic fever of kala-azar and also in diabetes, but it was not found to possess the virtues attributed to it.........The drug was given another fair trial in the form of a liquid extract in several cases of malarial fever, both in children and adults. Its action was found to be very slow. The drug had to be administered for several days before even mild cases were cured. In chronic cases it did not do any good, although it is a reputed medicine in the Hindu Pharmacopœia for all fevers (Koman).

The root and stem are useless in the antidotal treatment of snake-bite; the root is also useless as a collyrium or as an external application to the bitten part (Mhaskar and Caius). The root is equally useless in the treatment of scorpion sting (Caius and Mhaskar).

Arabic: Gilo—; *Bengal:* Gadancha, Giloe, Gulancha, Guluncha,

Nimgilo—; *Bombay:* Ambarvel, Gharol, Giroli, Guloe, Gulwel—; *Burma:* Singomone, Sinzamanne—; *Canarese:* Amrytaballi, Madhuparne, Uganiballi—; *Cantonese:* Fun khu hang—; *Central Provinces:* Gulwel—; *Ceylon:* Chintil—; *China:* K'uan chu Hsing—; *Deccan:* Gulbel, Gulo, Gulvel—; *French:* Culancha—; .*Goa:* Amritvel, Amrityel—; *Gujerati:* Gado, Galo, Gulo, Gulwel—; *Hansot:* Galavel—; *Hindi:* Giloe, Gulancha, Gulbel, Gurach, Gurcha—; *Indo-China:* Day than thong—; *Kathiawar:* Galo, Galonovelo—; *Kumaon:* Gulancha, Gurcha—; *Lepcha:* Kantherrik—; *Malaya:* Foon kan thang—; *Malayalam:* Amrytu, Peyamrytam, Sittamrytu—; *Marathi:* Ambarvel, Gharol, Giroli, Gulavela, Gulaveli, Guloe, Gulvel—; *Mundari:* Harajora, Harajuri, Harjora—; *Nepal:* Garjo—; *Persian:* Gulbel—; *Punjab:* Batindu, Garham, Garum, Gilo, Gilogularich, Zakhmihaiyat—; *Reddi:* Korapattatige—; *Sadani:* Hadjora—; *Sanskrit:* Amrita, Amritalata, Amritavallari, Amritavalli, Bhishakapriya, Chakralakshana, Chakrangi, Chandrahasa, Chandrapasa, Chchinna, Chchinnaruha, Chchinnodbava, Chchinnodhana, Dhira, Goraksha, Guduchi, Guluchi, Jivanthika, Jivantiha, Jwaranashini, Jwarari, Kundalini, Kundalli, Madhuparni, Madhuparnika, Nagakumarika, Nirjara, Pamrodhara, Pittaghni, Rasayani, Shyama, Somalatika, Somavalli, Surakrita, Tantri, Tantrika, Uddhara, Vara, Vataraktari, Vatsadani, Vayastha, Vishalya—; *Sikkim:* Gurjo—; *Sinhalese:* Galuchi, Rassakinda—; *Tamil:* Amridavalli, Amudam, Asasi, Kaippuchindil, Kunali, Narsindil, Niraidarudian, Paganrai, Padalamulam, Parivai, Pattigai, Sadi, Sagadundam, Sagamuli, Silam, Sindil, Sivandi, Sivedai, Ubavam, Vallikkandam, Vayamadu—; *Telugu:* Duyutige, Guduchi, Iruluchi, Jivantika, Madhuka, Manapala, Somida, Tellatippatige, Tippatige—; *Tulu:* Amrytaburu—; *Uriya:* Gulancha, Gulochi—.

ANAMIRTA Colebr.

A climbing shrub. Flowers panicled. Sepals 6, with 2 appressed bracts. Petals 0. Male flowers: Anthers sessile on a stout column, 2-celled, bursting transversely. Female flowers: Staminodes 9, clavate, 1-seriate. Ovaries 3, on a short gynophore;

stigma subcapitate, reflexed. Drupes on a 3-fid gynophore, obliquely ovoid, dorsally gibbous; style-scar subbasal; endocarp woody. Seed globose, embracing the subglobose, hollow, intruded endocarp; albumen dense, of horny granules; embryo curved; cotyledons narrow-oblong, thin, spreading.—Species 1.—Tropical Asia.

1. **Anamirta cocculus** Wight & Arn. Prodr. I (1834) 446.—*A. paniculata* Colebr. Trans. Linn. Soc. XIII (1819) 52, 66.—*A. toxifera* Miers in Ann. Hist. Nat. 3. ser. XIV (1864) 51.—*Cocculus flavescens* DC. Syst. I (1818) 520.—*Menispermum cocculus* Linn. Sp. Pl. (1753) 340; Roxb. Fl. Ind. III (1832) 807.—*M. heteroclitum* Roxb. l. c. 817.—*M. monadelphum* Roxb. Cat. Merc. Angl. Ind. Or t. 130.—*Natsjatam* Rheede Hort. Mal. VII (1688) t. 1.—PLATE 36.

A shrub, climbing to a considerable height; bark ash-coloured, vertically furrowed; young parts glabrous. Leaves subcoriaceous, 10-20 by 7.5—12.5 cm., broadly ovate, cordate or truncate (rarely attenuated) at the base, acute or acuminate (rarely obtuse), 5-(rarely 3-) nerved, glabrous above, pale beneath, with a tuft of hairs in the axils of the nerves except the basal ones; petioles terete, striate, glabrous, thickened at base and apex. Flowers 6 mm. diam., in branched glabrous panicles, 25—35 cm. long, on the old branches; branches of the panicle 2.5—5 cm. long, many-flowered; buds globular; pedicels short, 6-8 mm. long, divaricate. Sepals subequal, deciduous, ovate-oblong, concave, quite glabrous. Anthers, in the male flowers, forming a globose head on the short stout column of adherent fiilaments. Ovaries 3, on a very short smooth gynophore, surrounded at base by a ring of minute, fleshy, bifid staminodes; stigmas reflexed. Ripe carpels 1-3 (usually 2,) 12 mm. diam. on the thickened branches of the enlarged gynophore, smooth, black.

Distribution: Khasia Hills, Assam, E. Bengal, from Orissa and the Bombay Konkan to Ceylon.—Malay Archipelago to New Guinea.

The berry is slightly bitter; a good expectorant; removes gases from the intestines; good for rheumatism and as an application for inflammation; a poison to fish (Yunani).

The bitter berries are sometimes used in the form of an oint-

ment. This ointment is employed as an insecticide, to destroy pediculi, and in some obstinate forms of chronic skin diseases.

The fresh leaves are used in Bengal as a snuff in the treatment of quotidian ague.

In Ceylon the bruised fresh bark is applied to the bitten part in cases of snake-bite.

The jungle tribes of the Malay Peninsula use the plant to poison their arrows and their kriss.

An ointment containing 80 grains of finely powdered seeds to one ounce of vaseline was used as an external application in ringworm. Cases of one to two months' duration were cured by a few days' application, but chronic cases did not derive benefit from its use (Koman).

The bark, leaves, and berries are equally useless as an external application in the treatment of snake-bite (Mhaskar and Caius).

Both its poisonous properties and any therapeutic virtues the plant may contain depend upon picrotoxin of which the fruit is the source. The plant also contains two minor alkaloids of unknown constitution, menispermine and paramenispermine, both physiologically inactive.

Arabic: Mahijehreh—; *Bengal:* Kakamari—; *Bombay:* Kakaphala, Kakphal, Vatoli—; *Burma:* Hong—; *Calcutta:* Bacaenkaphal—; *Canarese:* Kakamari, Kakkisoppugade—; *Deccan:* Kakmari—; *Dutch:* Indiaansche rezies, Koklus—; *English:* Crow Killer, Fish Berry, Fish Killer, Indian Berry, Louse Berry, Oriental Berries, Poison Berry—; *French:* Arbre ă enivrer, Bois ă enivrer, Bois enivrant, Bois ivrant, Coque du Levant, Coque Levant, Herbe à tous maux, Pareire ă feuilles rondes—; *German:* Fischkoerner, Kokkelskoerner, Tollkoerner—; *Gujerati:* Jermae, Kakaphula, Kakmari—; *Hindi:* Jermae, Kakmari—; *Indo-China:* Ben nau, Day tao, Seg Dom—; *Italian:* Coccole d'India—; *Konkan:* Garudphul, Kadul—; *Malay:* Dawonnboelann, Tubabidji—; *Malayalam:* Anakrytu, Garalaphala, Garaphala, Kantakakonnuveli, Kantakakunavam, Karantakam, Miunannu, Machattinkaya, Nanninkuru, Pola, Pullukunavam—; *Oceania:* Lacton, Lagton, Libtang, Soma, Suma, Tubaflava—; *Pampangan:* Balasin, Bayati, Lactang, Lanta, Lictang, Lingtangbaguin,

Suma, Tuba—; *Persian:* Mahijehreh—; *Philippines:* Abutra, Pangmavan—; *Portuguese:* Coca de Levante, Fruta matapeixe—; *Sanskrit:* Garalaphala, Kakahva, Kakamari, Kakanashika—; *Sinhalese:* Pangan, Tittaval—; *Spanish:* Coca de Levante, Coca levantina—; *Tagalog:* Balasin, Bayati, Lactang, Lanta, Lictang, Lingtangbaguin, Suma, Tuba—; *Telugu:* Kakamari, Kakichempoo, Koditige, Tippatige—; *Tulu:* Chipulu—; *Urdu:* Mahijehreh—; *Uriya:* Kaumari—; *Visayan:* Balasin, Bayati, Lactang, Lagtal, Lanta, Lictang, Lintangbaguin, Suma, Tuba—.

TILIACORA Colebr.

A climbing shrub. Leaves ovate. Flowers in elongate panicles. Sepals 6, in 2 series, the outer small, the inner much larger, scarcely imbricate. Petals 6, minute, cuneate. Male flowers: Stamens 6; free; anthers 2-celled, introrse. Female flowers: Ovaries 3-12; styles short, subulate. Drupes obovoid, stalked, laterally compressed; style-scar subbasal; endocarp thin, obscurely ribbed, grooved on both sides. Seed hooked; albumen oily, ruminate; embryo nearly as long as the seed; cotyledons fleshy, appressed.—Species 15,—Tropical Africa, India.

This genus is therapeutically inert.

1. **Tiliacora acuminata** (Lam.) Miers. in Ann. Hist. Nat. ser. 2, VII (1851) 39.—*T. racemosa* Colebr. in Trans. Linn. Soc. VIII (1822) 67.

A woody climber; branches cinereous, striate; young shoots glabrous. Leaves 7.5—15 by 3.8—10 cm., 3-5 nerved, ovate, acuminate, cordate, truncate or rounded at the base, glabrous on both surfaces, shining above, very prominently reticulately veined beneath, margins undulate; petioles 1.3—2 cm. long. Flowers yellow, 6 mm. across, in elongate, lax, axillary, racemose panicles up to 30 cm. long; branches 2.5 cm. long, puberulous, at length glabrous, male 3-7-flowered at the apex, female 1-flowered; bracts subulate, hairy. Sepals alike in both sexes; the 3 outer ovate, acute, ciliolate, much shorter than the inner; the inner oblong, obtuse. Petals in both sexes obovate or suborbicular, slightly emarginate, much shorter than

the stamens. Drupes 1-10, reddish, 1.3 cm. long, ovate, compressed, shortly stalked.

Distribution: Bengal to Orissa and Konkan, Ceylon, Singapore, Java.—Cochin-China.

The root rubbed between stones and mixed with water, is given as a drink for the cure of venomous snake-bites (Roxburgh).

The root is not an antidote to snake venom (Mhaskar and Caius).

Bengal: Tiliakoru—; *Canarese:* Kuri—; *Hindi:* Bagamushada, Karraath, Karwanth, Rangoe—; *Malayalam:* Vallikkanniram—; *Telugu:* Kappatige, Nagamushini, Nallatige, Pataveru, Tigemushidi, Vettichitramulamu—; *Uriya:* Kolichiti.

COSCINIUM Colebr.

Climbing shrubs, not very stout. Leaves ovate, more or less peltate. Flowers in dense globose heads, in racemes or panicles. Sepals 6, orbicular. Petals 3, large, spreading, elliptic; anthers adnate, outer 1-celled, inner 2-celled. Female flower: Staminodes 6. Ovaries 3-6; styles subulate. Drupes globose; endocarp bony. Seed globose, embracing a globose intrusion of the endocarp. Albumen fleshy, ruminate. Embryo straight, cotyledons orbicular—Species 6. —Indo-Malayan.

The genus is of little importance in therapeutics.

1. **Coscinium fenestratum** (Gaertn.) Colebr. in Trans. Linn. Soc. XIII (1822) 51; Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I (1872) 99 (excl. *C. Wallichianum* et *Wightianum*).—*Menispermum fenestratum* Gaertn. Fr. I (1788) 219, t. 46, f. 5; Roxb. Fl. Ind. III (1832) 809.—PLATE 37.

A climbing shrub. Branches covered with fuscous-cinerous bark, striate, when young yellow-tomentose. Petiole 10—12 cm. long, inserted not far from the base of the lamina. Lamina coriaceous, shining and smooth above, minutely tomentose beneath, rotund-ovate or broadly cordate, almost truncate or emarginate at the base, at the apex suddenly linear-acuminate, sometimes irregular or bilobed at the base and sinuate, 15—25 by 12—25 cm.; basal nerves 5—7.

Inflorescences supraaxillary, finely tomentose, divaricating branches 2 cm. long, the male heads globose, dense-flowered, 6 mm. diam.; petals yellow, the outer 6-8 rotund, 1.5 mm. long and broad, the inner 3 longer, spathulate, 2 mm. long, 1 mm. broad, patent at the apex. Synandrium 1 mm. long. Carpels of female flower pilose; styles reflexed, filiform. Female fruiting peduncles 2-3 cm. long; drupes 1-3, very shortly stipitate, subreniform-globose, slightly tomentose, fuscous, about 2—2.5 cm. diam.; endocarp 1.3 cm. long, 1.9 cm. broad, bony, smooth, with an obsolete dorsal line.

Distribution: S. India, Ceylon.—Sumatra.

The root is extensively used in Ceylon as an efficient bitter tonic, and is viewed as a very good substitute for Columba. It has also antiseptic properties to a great extent, and can be used for dressing wounds and ulcers.

The wood is valued as a bitter tonic by the Sinhalese. It is also much used as a cure for tetanus.

A decoction of the stem is given internally in cases of snake-bite.

The stem contains berberine, and enters into the preparation of Malayan arrow and dart poisons.

The decoction of the bark was administered in doses of one to two ounces three times a day to several patients suffering from malarial fever, but no beneficial effects were noticed (Koman).

The stem is not an antidote to snake venom (Mhaskar and Caius).

Tumminkatti & Shintre have analysed the alcoholic extract of the stems, and they report *inter alia* a considerable amount of a mixture of alkaloids (17th Ind. Sc. Congress; Allahabad, 1930).

Bengal: Haldigach—; *Canarese:* Doddamaradarasina, Maradarashina, Maramanjali—; *Deccan:* Jhadihaladi, Jharkihaldi—; *English:* Calumba Wood, Ceylon Calumba Root, Columbo Wood, False Columbo, Tree Turmeric—; *Malay:* Tol—; *Malayalam:* Haridram, Maramannal—; *Marathi:* Venivel—; *Sanskrit:* Daruharidra, Darvi, Pitadru—; *Sinhalese:* Bangwellgetta, Venivel, Woniwol—; *Tamil:* Atturam, Imalam, Kadari, Manjalkodi, Maramanjal, Pasamantram,

Sanniyam, Seyebasam, Tiyaram, Udaravi, Udubadi—; *Telugu:* Manupasupu—; *Tulu:* Maramanjali—.

COCCULUS DC.

Climbing or sarmentose shrubs. Flowers in axillary, usually short panicles. Sepals 6, in 2 series, the inner larger. Petals 6, shorter than the sepals, usually auricled. Male flowers: Stamens embraced by the petals; anthers subglobose, cells bursting transversely. Female flowers: Staminodes 6 or 0. Ovaries 3; styles usually cylindric. Drupes laterally compressed; endocarp horseshoe-shaped; dorsally keeled and tuberculate, sides excavate. Seeds horseshoe-shaped; albumen scanty; cotyledons linear, flat, appressed.—Species 11.—All warm countries.

I. Scandent shrubs.
  1. Leaves suborbicular, glabrous; panicles large .... 4. *C. macrocarpus.*
  2. Leaves deltoid or hastate, villous; panicles short .... 1. *C. hirsutus.*
  3. Leaves oblong or trapezoidal, at length glabrous. Male flowers fascicled, female solitary .... 2. *C. pendulus.*

II. A shrub or small tree .... 3. *C. laurifolius.*

The roots are tonic, stomachic, diuretic, and antiperiodic.

C. laurifolius DC., and *C. trilobus* DC., are used medicinally in Indo-China; *C. trilobus* DC. also in Malaya.

Several species enter into the preparation of arrow and dart poisons.

1. **Cocculus hirsutus** Diels in Engler's Pflanzenr. IV, 94 (1910) 236.—*C. villosus* DC. Syst. I (1818) 525.—*C. sepium* Colebr. in Transact. Linn. Soc. XIII (1822) 58, t. 6, f. 2.—*C. Aristolochiae* DC. Syst. 1 c. 520.—*Menispermum hirsutum* Linn. Sp. Pl. (1753) 341; Roxb. Fl. Ind. III (1832) 814.—*M. villosum* Lam. Dict. IV (1797) 97 (non Roxb.)—PLATE 38 B (under *C. villosus* DC.).

A straggling, scandent shrub; young parts densely and softly villous; branches striate. Leaves 3.8-6.3 by 1.3-3.8 cm., 3-5-nerved, ovate-oblong, subdeltoid or subhastate, obtuse, subacute or retuse, apiculate, subcordate or truncate at the base, softly villous on both surfaces, at length nearly glabrous; petioles 3 mm. long, densely villous. Male flowers in small axillary cymose panicles; pedicels

slender; bracts minute, subulate, hairy. Sepals oblongovate, hairy outside, the 3 inner the larger. Petals thinly membranous, obovate, emarginate, embracing the stamens, smaller than the petals of the female flowers. Female flowers in axillary clusters, 2-3 together, rarely racemose. Petals thick and fleshy, divided at the apex into two triangular lobes with swollen bases, claw hairy. Ovaries 3, smooth; stigmas terete, thick reflexed. Drupe size of a small pea, keeled, transversely rugose.

Distribution: Tropical and subtropical India from the foot of the Himalayas to S. India and Ceylon, Pegu.—S. China, Arabia, tropical Africa.

The root has an unpleasant taste, very sweet and then bitter; smell sweetish and pungent; alexipharmic; destroys "kapha" and "vata"; lessens bile, and burning sensation; enriches the blood; useful in urethral discharges (Ayurveda).

Antipyretic, tonic; lessens thirst; good in fractures; good for tubercular glands when mixed with sesame oil (Yunani).

A decoction of the fresh roots, with a few heads of pepper, in goat's milk, is administered for rheumatic and old venereal pains; half a pint every morning is the dose. It is reckoned heating, laxative, and sudorific.

In the Konkan, the roots, rubbed with Bonduc nuts, are administered as a cure for belly-ache in children. In bilious dyspepsia, they are given in 6 *massa* doses, with ginger and sugar.

The root is generally used as a refrigerant, and also as a gentle laxative. It has been extensively used as an alterative in chronic rheumatic and venereal diseases.

In Sind, the root and leaves are used in headche and neuralgic pains (Murray).

The juice of the leaves, mixed with water, has the property of coagulating into a green jelly-like substance, which is taken internally, sweetened with sugar, as cure for gonorrhœa.

In Baluchistan the mucilage is used to cure spermatorrhœa, taken in milk; it is used for coughs and to put on to sore eyelids and to soften breasts (Hughes-Buller).

Baluchistan: Afaband, Zamur—; *Bengal:* Huyer—; *Bombay:* Parvel, Vasanvel—; *Canarese:* Dagadiballi, Dusariballi, Sugadiballi, Yadaniballi—; *English:* Broom Creeper, Ink Berry—; *Gujerati:* Vevati, Vevdi—; *Hansot:* Vachhana—; *Hindi:* Chireta, Dier, Faridburti, Hier, Jalayamani, Jamtikibel—; *Konkan:* Vanatiktika—; *Marathi:* Hunder, Parvel, Tana, Vasanavela, Vasanvel—; *North-Western Provinces:* Patha—; *Persian:* Faridbutti—; *Porebunder:* Vadhinovelo—; *Sanskrit:* Patalagarudi, Chchilihinda, Dirghakanda, Dirghavalli, Dridhakanda, Dridhalata, Garudi, Mahahala, Mahamula, Mochakabhida, Sauparni, Somavalli, Tiktanga, Vanatiktika, Vasandi, Vasantitikta, Vatsadani—; *Sind:* Kursan, Zamir—; *Tamil:* Kattukkodi—; *Telugu:* Chipurutige, Dusaritige, Katlatige—; *Urdu:* Faridbutti—; *Uriya:* Musakani—.

2. **Cocculus pendulus** Diels in Engl. Pflanzenr. IV, 94 (1910) 237.—*C. Leaeba* DC. Syst. I (1818) 529.—*C. Cebatha* DC. l. c. 527.—*C. glabra* Wight & Arn. Prodr. I (1834) 13.—*Epibaterium pendulum* Forst. Gen. (1776) 108, t. 54.—PLATE 38 A (under *C. Leaeba* DC.).

A scandent shrub; branches cinereous, striate, glabrous; branchlets long, slender, puberulous, at length glabrate. Leaves very variable, 18-38 by 9-18 mm., 3-5-nerved, oblong, or trapezoidal with rounded angles, subhastate, or sometimes linear-oblong, usually obtuse, mucronate, glabrous (except when young), base cuneate or rounded; petioles 3-6 mm. long, hairy. Flowers axillary, small, inserted in a hairy tubercle, the males clustered in dense axillary fascicles, the females solitary (rarely twin). Petals of the male flowers deeply and acutely emarginate, with 2 lateral lobes embracing the stamens. Ovaries 3. Drupe obovoid, keeled, compressed; style-scar basal.

Distribution: Sind Baluchistan, Waziristan, Punjab Plains to N. Circars, Kathiawar, Deccan and Carnatic to Tinnevelly.—Afghanistan, Arabia, tropical and subtropical Africa.

It is used in Sind and Afghanistan in the treatment of intermittent fevers.

Gujerat: Parwatti—; *Punjab:* Illarbillar, Parwatti, Vallur, Vehri—; *Sind:* Ullarbillar—; *Telugu:* Dusaratige—.

3. **Cocculus laurifolius** DC. Syst. I (1818) 530.—*Menispermum laurifolium* Roxb. Fl. Ind. III (1832) 815.

A large evergreen shrub or small tree, attaining 1.2 m. girth and 6 m. high. Twigs smooth, green, glabrous except in the leaf-axils. Bark slightly rough mainly owing to the presence of numerous small raised circular lenticels, pale brown. Blaze 2.5-7.5 mm., white. Leaves 7.6—15 by 2.5—4.4 cm., lanceolate or elliptic-lanceolate, entire, glabrous, glossy dark green above, pale and glossy beneath, with 3 strong basal nerves distinctly pale above. Petiole 5—12.5 mm. long, flattered on the upper surface. Flowers minute, yellowish, in pedunculate capitate cymes 5-7.5 mm. long, solitary and axillary, or arranged in axillary panicles up to 5 cm. long. Drupe 5-6 mm. diam., globose, shining, black and juicy, containing a single seed.

Distribution: Subtropical Himalaya from Nepal to Jammu up to 5,000 ft., W. Ghats of Madras Presidency, E. Bengal, Burma.—S. Cochin-China, S. China, Java, Formosa, Japan.

The jungle tribes of the Malay Peninsula use the plaint to poison their arrows and darts.

China: Wu Yao—; *Japan:* Kansirowujak, Ujaku, Wujak—; *North-Western Provinces:* Tilphara—.

4. **Cocculus macrocarpus** W. & A. Prodr. (1834) 12.—*Diploclisia glaucescens* Diels in Engler Pflanzenr. IV, 94 (1910) 225.

A shrub, climbing to a great height; trunk sometimes reaching nearly 30 cm. diam. with wrinkled back; young branches dark brown, striate. Leaves variable in shape, usually broader than long, 5-10 by 6.3—11.5 cm., 5-nerved, reticulately veined, rotund or reniform (rarely broadly ovate, acute), truncate or cordate at ths base, mucronate, glabrous above, glaucous beneath, margins somewhat undulate; petioles 5—12.5 cm. long, slender, yellowish, more or less inserted within the margin of the blade. Inflorescence in large, much-branched, glabrous, pendulous panicles 45—60 cm. long; peduncles usually many, in divergnt fascicles from the old wood; flowers yellow, faintly fragrant, in fascicles or umbels along the rhachis; pedicels slender. Sepals thinly membranous, marked (as are the petals and ovaries) with purple lines and spots; the inner

sepals obovate-oblong, rather larger than the outer. Petals broadly cuneate, 3-lobed; the middle lobe emarginate, rarely acute; the lateral lobes embracing the stamens. Anthers subglobose. Ovaries oblong, incurved. Ripe carpels 1-2, nearly sessile, 2.2-2.5 cm. long, obovate-oblong, compressed, tapering to a short neck, glaucous; style-scar conspicuous, basal; endocarp transversely ridged. Seed doubled into a hook.

Distribution: Konkan, N. Kanara, S. M. Country.—China.

The leaves are powdered and taken in milk as a cure for biliousness, gonorrhœa, and syphilis.

Tamil: Kottaiyachachi—.

PACHYGONE Miers.

Climbing shrubs. Leaves mostly ovate or oblong. Racemes extra-axillary. Male flowers: Sepals 6, membranous, concave, the 3 outer ones smaller and narrower. Petals 6, small, base auricled, embracing the filaments. Stamens 6, free; filaments incurved; anthers subglobose, didymous, bursting transversely. Female flowers: Staminodes 6, carpels 3, glabrous; short style excentric, suddenly bent; stigma horizontal. Drupes 3, fleshy; style-scar subbasal; endocarp reniform-orbicular, subcompressed. Seed horseshoe-shaped, no albumen, Cotyledons thick, accumbent, much longer than the radicle.—Species 11.—Indo-Malayan.

This genus is therapeutically inert.

1. **Pachygone ovata** (Poir.) Miers ex Hook. f. & Th. Fl. Ind. I (1855) 203, in Contrib. Bot III (1871) 331, pl. 135.—*Cocculus Plukenetii* DC. Syst. I (1818) 520; Wight Ic. III (1844) t. 824, 825.—*Koon zeylanicus* Gaertn. Fruct. II (1791) 486, t. 180, f. 11.

A lofty climber; branches tomentose. Leaves 3-8 by 2-4.5 cm., ovate-oblong or subtrapezoid, at base rotund-truncate or more or less narrowed, at apex obtuse or slightly acute, sometimes mucronate, 3-5-nerved; petiole pubescent or glabrate, 1—2.5 cm. long. Male pseudoracemes axillary, solitary, 3-10 cm. long; bracts lanceolate-linear, acute, ca. 2-4 mm. long; pedicels 2-5-fascicled, ca. 1-2 mm.

long. Sepals glabrate, outer ones oblong-spathulate, yellowish, 1-2 mm. long, ca. 0.5 mm. broad, inner ones concave, obovate-elliptic, ca. 2 mm. long, 1.5 mm. broad. Petals 6, small, membranous, at the base auriculate-inflexed, 0.7 by 0.5 mm. Stamens ca. 0.5 mm. long. Female flowers not known. Drupe ca. 7—9 mm. long and broad; orbicular-reniform or obovate-spheroidal.

Distribution: S. India (Nellore, Anamallay), Ceylon.

The dried fruit is used for the purpose of destroying vermin and stupefying fish.

Burma: Ngupyu—; *Ceylon:* Kadukkodi—; *Tamil:* Kadukkodi—.

PERICAMPYLUS Miers.

Slender, woody climber. Leaves subcordate, edge subcrenate, more or less pubescent; nerves palmate. Cymes: Males 3 to 6-fascicled, females solitary or in pairs. Sepals imbricate, 3 outer minute, bract-like, 6 inner obovate. Petals 6, subobovate, margins inflexed round the stamens. Stamens free or connate. Female flowers: Staminodes 6; terete, longer than the petals. Carpels 3. Stigma bifid or doubly bifid. Drupes 3, suborbicular, flattened; endocarp with transverse ridges with tubercles.—Species 6.—Indo-Malayan.

This genus is therapeutically inert.

1. **Pericampylus glaucus** (Lam.) Blatter, nom. nov.—*Menispermum glaucum* Lam. Dict. IV (1797) 100.—*Pericampylus incanus* (Colebr.) Miers in Ann. Nat. Hist. 2. ser, VII (1851) 40, Contrib. Bot. III (1871) 118, p. 111.—*Cocculus incanus* Colebr. Trans. Linn. Soc. XIII (1822) 57.—*Menispermum villosum* Roxb. Fl. Ind. III (1832) 812 (non Lam.).—PLATE 39 (under *P. incanus* Miers).

Young branches grey-tomentose. Leaves herbaceous, ovate obtuse, base broad truncate, above glabrous, beneath grey-tomentose; nerves 5 pairs radiating from base, 3.8—6.3 cm. long, 4.3—6.8 cm. wide; petioles 1.5 cm. long, slender tomentose. Compound cymes axillary, 2-6 together in male, solitary in female, 1.8 cm. long, tomentose. Flowers small, fragrant. Males: Sepals, outer small, sub-

ovate, inner ones larger, obovate obtuse, green or yellow. Petals spathulate or obovate, hyaline. Stamens free. Females: Staminodes short linear. Carpels 3. Drupes 3, transversely obovate; endocarp bony with a linear keel ornate with spines and tubercles. Seed 5 mm. long.

Distribution: Sikkim, Khasia, Assam, Pegu, Martaban, Tenasserim, Mergui, Chittagong, Nicobars, Malay Peninsula,—Malay Archipelago eastwards to the Moluccas, Cochin-China, Laos, Tonkin, S. China, Formosa.

The roots have long been held in great repute among snake-charmers in India as an antidote to the bites of poisonous snakes.

The root is not an antidote to snake venom (Mhaskar and Caius).

Bengal: Barakkanta—; *Cochinchina:* Day loi tien—; *Java:* Aroygeureung—; *Nepal:* Lahara, Pipalpati—; *Sumatra:* Currung—.

STEPHANIA Lour.

Scandent shrubs, rarely herbs. Leaves peltate. Inflorescence mostly pseudoumbellate, simple or compound, rarely paniculate. Male flowers: Sepals 6-8, mostly subequal, concave, obovate, rarely unequal. Petals 3-4, dilate-obovate or suborbicular, rarely 0. Stamens 6; anthers on the rim of the flattended top of the staminal column. Female flowers: Sepals 3-6, petals 2-4, similar to those of the male flowers; carpel 1; style almost absent; stigma shortly lobed or 3-6-laciniate. Drupe: Exocarp fleshy, glabrous; endocarp bony, compressed, horseshoe-shaped, dorsally tubercled, sides concave, often perforate. Seeds hippocrepiform, convex on the dorsal, almost plane on the ventral side; embryo embedded in fleshy albumen, hippocrepiform, terete; cotyledons incumbent, almost as long as the radicle.—Species 32.—Old World, chiefly tropical Africa, China and Malayan Islands.

1. Leaves ovate or subdeltoid, peltate .... 1. *S. hernandifolia.*
2. Leaves broadly ovate or suborbicular, at the base rotund .... 2. *S. glabra.*

In general the root is a bitter tonic.

S. glabra Roxb. is used medicinally in Indo-China, *S. meyeriana* Harv. in Southern Africa.

1. **Stephania hernandifolia** (Willd.) Walp. Report. I (1842) 96; Hook. f. Th. in Hook. f. Fl. Brit. Ind. I, 103 (partim).—*Cissam-*

pelos hernandifolia Willd. Sp. Pl. IV (1805) 861; Roxb. Fl. Ind. III (1832) 482.—*C. Hexandra* Roxb. l.c. 841.—*Clypea hernandifolia* Wight & Arn. Prodr. I (1834) 14; Wight Ic. (1840) t. 939.—PLATE 40.

A slender twining shrub; branches thin, striate, sparingly pilose or glabrate. Petioles 3—6.5 cm. long; lamina peltate, thinly papyraceous, glabrous above, paler or glaucous below, with the nerves below floccose-puberulous, sometimes subtomentose, rarely glabrate, ovate, rounded at base, acute at apex or rarely obtuse and minutely mucronulate, 4-15 cm. long, 4-12.5 cm. broad. Male umbels more or less puberulous, sometimes compound; peduncle 1.5-5 cm. long, often fuscous-puberulous; rays and raylets when present 3-8, producing globose-capitate cymules at the apex. Sepals 5-8, minutely puberulous on the outer side, elongate-obovate, 1—1.5 mm. long, 0.5—0.6 mm. broad, yellow; petals 3-4, broadly obovate, 0.7—0.8 mm. long; synandrium 0.5—0.7 mm. long. Female sepals 3-4, about 1 mm. long, 0.6 mm. broad; petals conchiform, about 0.8 mm. diam. Drupe 6 mm. long, 4 mm. broad, compressed; endocarp with transverse ridges which are often spinulate on both sides, 5-6 mm. long, 4-5 mm. broad; condyle perforate.

Distribution: W. and E. coast, Cachar, Sikkim, E. Bengal, Assam, Penang.—Siam, Malay Archipelago, Australia.

The bitter root enters into the composition of a good many Ayurveda preparations as a substitute for that of *Cissampelos pareira* Linn.

It is regarded as bitter, astringent, easily digestible, and useful in fever, diarrhœa, urinary diseases, dyspepsia, etc.

The extract acts as a strong poison on frogs (Bancroft).

Bengal: Agnadnemuka, Akanadi—; *Burma:* Sha ma say nway—; *China:* Ch'ien Chin T'end—; *Java:* Areujgeureung, Ojotminjak—; *Malayalam:* Patakilannu, Patavalli—; *Nepal:* Tambarki—; *Sanskrit:* Ambashtha, Patha, Vanatiktika—; *Saora:* Duvyatige—; *Sinhalese:* Lunuketiyawel, Lupuketiyawel—; *Uriya:* Musakani, Nimukha, Okanobhindi, Sondhimali—; *Zulu:* umTambane—.

2. **Stephania glabra** Roxb. Miers in Ann. Hist. Nat. Soc. 3, ser. XVIII (1866) 14 n. n.; Diels in Engl. Pflanzenr. IV, 94 (1910) 272 (excl. Clypea Wightii).—*S. rotunda* Hook. f. & Th. Fl. Ind. I (1855) 198; in Hook. f. Fl. Brit. Ind. I 103 (partim, excl. omnib. syn.).—*Cissampelos glabra* Roxb. in Fl. Ind. III (1832) 840.—PLATE 41 (under *S. rotunda*).

Branches fistular, sulcate-striate, glabrous. Leaves herbaceous-membranous, glabrous on both sides, pale glaucescent below, broadly ovate or suborbicular, at the base rotund, 4—12 cm. broad, primary nerves about 5; petiole 3—15 cm. long, slender. Male inflorescence axillary or on leafless branchlets arising by the side of minute bracts. Peduncle 4—8 cm. long, rays of umbels often 6, very slender. Flowers on filiform 2-4 mm. long pedicels, narrowly obconic. Sepals: 3 outer ones linear-oblong, 2-2.5 mm. long, scarcely 0.5 mm. broad, 3 inner ones obsphathulate, 2-2.8 by 0.5-0.7 mm. Petals 3, stouter, obspathulate, at the apex sometimes 3-lobulate, biglandular above the middle, ca. 1.8 mm. long and broad. Synandrium 1.5—2 mm. long. Fruiting umbels with rays 1.5 cm. long, pedicels 0.6—0.8 cm. long. Drupes obovate, compressed; endocarp with 20-25 transverse ribs running from the dorsal line.

Distribution: Himalaya from Simla to Sikkim, Khasia Hills, Assam, Tenasserim.

Roxburgh states that the acrid root is used medicinally in Sylhet.

In Cochin-China it is used in pulmonary tuberculosois, asthma, dysentery, and fever.

Annam: Cu binh voi, Cu mot, Tu nhien—; *Dehra Dun:* Purha—; *Garhwal:* Gindaru—; *Nepal:* Barkulilahara, Nimilahara, Tambarki—; *Tongking:* Day moi tron—.

CISSAMPELOS Linn.

Suberect or climbing shrubs. Leaves often peltate. Male flowers cymose. Sepals 4. Petals 4, connate into a subentire, short cup. Anthers 2-4, sessile, connate, encircling the top of the peltate staminal column, bursting transversely. Female flowers racemose, crowded in the axils of roundish, leafy bracts. Sepals and petals 1 of each, 2-nerved, adnate to the bracts. Staminodes O. Ovary 1;

style short, 3-fid or 3-toothed. Drupe sublobose; style-scar subbasal; endocarp compressed, dorsally tubercled, the sides excavated. Seed horseshoe-shaped; embryo linear; cotyledons appressed.—Species 21.—Warm regions.

The root is diuretic, antilithic, and antiperiodic.

The following are used medicinally in the Philippine Islands and Indo-China—*C. pareira* Linn.—; in the Antilles and Guiana—*C. pareira* Linn.—; in South America—*C. caapeba* Linn., *C. pareira* Linn.—; in Brazil—*C. glaberrima* St. Hill., *C. ovalifolia* DC.—; in the Gold Coast—*C. owariensis* P. Beauv.—; in Southern Africa—*C. capensis* Thunb., *C. pareira* Linn., *C. torulosa* E. Mey.—; in Mauritius—*C. mauritiana* Pet. Th.—.

OFFICIAL:—The root of *C. Pareira* Linn. in Portugal.

1. **Cissampelos pareira** Linn. Sp. Pl. (1753) 1031 ampl.—*C. Caapeba* Roxb. Fl. Ind. III (1832) 842.—*C. convolvulacea* Willd. Sp. Pl. IV (1805) 863; Roxb. l.c. 842; Wight & Arn. Prodr. I (1834) 14.—*C. triandra* Roxb. l.c. 842.—*Batta valle* Rheede in Hort. Malab. XI (1692) 127, t. 62.—PLATE 42.

A climbing shrub; branches striate, pubescent or subglabrous. Leaves peltate, 3.8—10 cm. diam., orbicular or reniform, often slightly broader than long, cordate or truncate or truncate at the base, mucronate, pubescent on both surfaces when young, at length glabrous, underside pale or subglaucous, margins ciliate; petiole 3.8-10 cm. long, pubescent, inserted 3-6 mm. within the basal margin. Flowers minute, yellowish. Male flowers pedicelled in nearly axillary cymes; peduncles filiform, 18 mm. long, pubescent; bracts small, subulate. Sepals 4, hairy outside, obovate-oblong, concave. Petals combined into a cyathiform corolla, hairy without, glabrous within, half the length of the sepals. Filaments longer than the corolla. Female flowers in elongate, solitary or twin, axillary racemes; pedicels very short, pubescent or villous; bracts foliaceous, more or less stalked or nearly sessile, orbicular or reniform, mucronate, usually softly villous (sometimes glabrous), ciliate, persistent. Sepal 1, ovate-oblong, villous on the outside. Petal 1, subrotund, about half the

length of the sepal. Drupe subglobose, compressed, hairy, red; endocarp transversely ridged.

Distribution: Throughout tropical and subtropical India.—Warm parts of Asia, E. Africa and America.

Hot, sharp and bitter taste; destroys "vata" and "kapha"; removes pain, fever, dysentery, skin eruptions, heart troubles, burning, itching; alleviates vomiting, asthma; removes intestinal worms; cures enlarged spleen and ulcers; in hemicrania helps parturition, useful in piles, uterine complaints. The variety "Laghupatha" has the same properties (Ayurvera).

The root is prescribed in combination with other drugs for the treatment of snake-bite (Charaka, Sushruta, Vagbhata, Yogaratnakara) and scorpion sting (Charaka, Sushruta, Vagbhata, Vrindamadhava, Baishajyaratnavalli, Chakradatta, Ashtangasangraha).

The root is the part most esteemed; it has an agreeable, bitterish taste, and is considered a valuable stomachic. It is frequently prescribed in the later stages of bowel complaints, in conjunction with aromatics. It is given for pains in the stomach and for dyspepsia, diarrhœa, dropsy, and cough; also for prolapsus uteri. It is applied externally in snake bite and scorpion sting.

Among the Mundas of Chota Nagpur the root, ground and mixed with water, is used against stomach-ache and diarrhœa, especially against infantile diarrhœa (Encyclopædia Mundarica).

The Chuanas, Subias, and Kobas of South Africa drink an infusion of the powdered root for stomach-ache. The Filabusi natives and the Xosas drink a similar preparation for snake-bite. The Pedis use a decoction of the root as a wash for children who have pimples over their body.

In Madagascar the root is considered diuretic, emmenagogue, and antipyretic; it is given for urinary gravel.

In La Reunion the bitter root is considered tonic, stomachic, and diuretic; and it is used in the treatment of bladder trobules.

In French Guina the roots are used as a diuretic in cases of dysuria and calcular nephritis. An infusion is expectorant and is considered a potent alexiteric.

The root acts as an antiseptic of the bladder and is used in chronic inflammation of the urinary passages.

The leaves are said to have a peculiarly cooling quality, and they are used locally in cases of unhealthy sores and sinuses. In the Gold Coast they are applied to abscesses. The Xosas apply a paste of the leaf to wounds.

The root is not an antidote to snake venom (Mhaskar and Caius), and it is useless as an external application in the treatment of scorpion sting (Caius and Mhaskar).

The root contains the alkaloid bebeerine.

Annam: Moi tron, Tiet re—; *Antsianaka:* Voaravinaviavy—; *Ashanti:* Akuraso—; *Batangas:* Calancalamayan—; *Bengal:* Akanadi, Nemuka, Nimuka, Tejomalla—; *Betsileo:* Vahemboatavo—; *Betsimisaraka:* Vahifotsy—; *Bombay:* Pahadmul, Pahadvel, Venivel—; *Canarese:* Padavali—; *Cebu:* Batangbatang—; *Chuana:* Mokaekae—; *Dun:* Parhe—; *East Africa:* Kinukadjio—; *English:* False Pareira brava, Velvet-leaf—; *Filabusi:* M'cessie—; *French:* Faux pareira brava, Liane à glacer, Liane à serpents—; *French Guiana:* Pareira brava, Paria brava—; *Gahrwal:* Pahari, Parhe—; *Goa:* Parayel—; *Gujerati:* Venivel—; *Hausa:* Jibdakassa—; *Hindi:* Akauadi, Dakhnirbissi, Harjeuri, Pari—; *Hova:* Vahivory, Voriravina—; *Ilocano:* Cuscusipa—; *Java:* Areujtjantjuan—; *Koba:* Mokaekae—; *La Reunion:* Liane blanche, Pareira brava—; *Lepcha:* Tamshaprip—; *Madagascar:* Ravinbury, Vahenosy—; *Malay:* Akar mumpanang, Gasing-gasing—; *Malayalam:* Kattuvalli, Patuvalli—; *Marathi:* Padavali, Padavel, Pahadvel, Paharmul, Paharvel—; *Mexico:* Oreja de raton—; *Mundari:* Cutulutur, Haruarajaite, Huringpitusing—; *Nepal:* Batulpoti—; *North-Western Provinces:* Duknirbissi—; *Pedi:* Lepeta—; *Philippines:* Calaad, Chanchae, Sansao—; *Porebunder:* Kardhiyunbang—; *Porto Rico:* Bejuca de mono—; *Portuguese:* Abutua, Pareira brava—; *Punjab:* Bat, Batindupath, Bel, Katori, Parbik, Pataki, Tikri, Zakhmihaiyat, Zucumyeat—; *Sakalave:* Hamafana—; *Sanskrit:* Ambashtha, Ambashthika, Avidhakarni, Brihattikta, Chchinnaveshika, Devi, Ekashthila, Kuchela, Kucheli, Laghupatha, Mahanjasi, Malati, Malavi, Papacheli, Papehelika, Patha, Patika, Prachina, Prachinambastika, Pratanini, Rasa, Ruchishya, Shishira, Shreyasi, Sthapini,

Susthira, Tiktapushpa, Trishira, Trivrita, Uthika, Vallika, Vara, Varatikta, Vatsadini, Venivalli, Vidhakarni, Vridhakarnika, Vriki, Vrittaparni—; *Santal:* Tejomalla—; *Saora:* Paterutivu—; *Sind:* Belpath, Katori—; *Sinhalese:* Deyamitta, Weniwela—; *Spanish:* Butua, Pareira brave—; *Subia:* Mokaekae—; *Tagalog:* Chinchao-chinchauan, Gulangulamanan, Sansaosansaosan, Yemoumohan—; *Tamil:* Appatta, Punaittitta, Puttutiruppi, Sina, Titta, Tuvan, Tuvigaba, Vattattiruppi—; *Telugu:* Adivibankatige, Pata, Visaboddi—; *Twi:* Aportororkungma—; *Uriya:* Okanobindhi—; *Visayan:* Hampapari, Himpapara, Pari, Sampapari—.

JATRORRHIZA Miers.

High, scandent undershrubs. Leaves large, long-petioled, cordate at base, rotund, 3-5-7-lobed. Racemes axillary, setose-ciliate. Flowers subsessile. Male flowers : Sepals 6, the 3 outer elongate-elliptic, 3 inner broader, obovate, imbricate. Petals 6, very concave, mostly suddenly patent-recurved at the apex, the sides introflexed and covering the andrœcium. Stamens 6, free or connate at the apex, anthers extrorse, globose, 4-locular, opening by a transverse slit. Female flowers : Sepals and petals similar to those of the male flowers. Petals cuneate, obovate, the sides introflexed ; staminodes 6, tongue-shaped, adnate to the base of the petals. Carpels 3, free, erect, semi-pyriform, clothed outside with strigose, glandular hairs ; style short, bent outwards; stigma expanding into 2-3-fid laciniæ. Drupe ovoid, showing a subterminal scar of the style ; exocarp thick, fleshy, hispid ; endocarp applanate-ovoid, on the back convex, tubercular and clothed with numerous fibrillose hairs. Seed meniscoid ; albumen fleshy, ruminate; embryo subcurvate; cotyledons laterally divaricate.—Spicies 2.—Tropical Africa ; one cultivated in India.

Root tonic.

J. palmata Miers. is official in all pharmacopœias. The difference in botanical origin in merely one of synonymy ; and there is considerable confusion in the spelling of both the generic and specific names as shown under MENISPERMACEÆ.

1. **Jatrorrhiza palmata** (Lam.) Miers in Hook. Niger Fl.

(1849) 214 in nota, in Ann. Nat. Hist. 2, ser. VII (1851) 38; Diels Engl. Pflanzenr. IV, 94 (1910) 166, f. 1.—*Cocculus palmatus* DC. Syst. I (1818) 522; Hook. in Bot. Mag. t. 2970, 2971.—*Menispermum Columba* Roxb. Fl. Ind. III (1832)) 807.

Stem and petioles clothed with strigose hairs. Petiole 20-25 cm. long ; lamina 15-35 by 18-40 cm., membranous, paler below, on both faces with scattered strigose hairs or glabrescent ; broadly rotund, base inciso-cordate, mostly 5-lobed, lobes dilatate-ovate, acuminate at the epex, sometimes again angular-sinuate ; primary nerves mostly 7-palmate, secondary nerves and veins prominent below. Male racemes compound, elongate, up to 40 cm. long ; rhachis clothed with strigose hairs; lateral branchlets 2—8 cm. long with the rhachis sub-capillary, flexuose, glabrate; bract linear-lanceolate, setose-ciliate; flowers on the branchlets few, sessile, ebracteate. Sepals patent, elliptic, 3 mm. long, 1.5 mm. broad, or smaller, greenish. Petals with involute margins, truncate at the apex, up to 2 mm. long, embracing the stamens. Stamens adnate to the base of the petals, 1--1.8 mm. long. Fruiting inflorescence 10—15 cm. long. Drupe subovoid, densely strigose-hispid, 2-2.5 cm. long, 1.5-2 cm. broad.

Distribution: Cultivated in some places.—Native of S.-E. Africa.

The root is much used in Zambezi, Mozambique, Madagascar, and Indo China as a bitter tonic and stomachic. By the natives of Mazambique it is used in dysentery and various other diseases.

It is a mild bitter free from astringency. It is useful in functional atonic conditions of the digestive organs, especially with other tonics, aromatics, or cathartics.

The root contains three physiologically active bases : columbamin, jateorhizin, and palmatin.

Belgium : Colombo—; *Bombay :* Colombo—; *Denmark :* Kolumbo—; *England :* Calumba, Colombo—; *France :* Colomo—; *Germany :* Kolombo—; *Hollond :* Calumba—; *Hungary :* Calumba—; *Indo China :* Phong Ky—; *Italy :* Colombo—; *Japan :* Calumba—; *Norway :* Kolumbo—; *Portugal :* Calumba—; *Russia :* Kolombo—; *Spain:* Colombo—; *Sweden:* Kalumba—; *Switzerland:* Colombo—;

Tamil: Kolumbu—; *Telegu:* Kalamba—; *Turkey:* Guvercin, Kalumba—; *United States :* Calumb, Columba, Columbo—; *Uriya :* Kolombo—.

BERBERIDACEAE.

Glabrous herbs or shrubs, sometimes climbing. Leaves simple or compound, rarely stipulate. Flowers hermaphrodite or rarely diclinous, regular, axillary, solitary or in simple or compound racemes, usually yellow or white. Sepals often petaloid, 3-9, in 1-3 whorls. Petals equal in number to the sepals or twice as many, and, like them, caducous. Stamens 4-8, usually 6, opposite to the petals ; filaments free or connate ; anthers bursting by two apical valves or longitudinally . Carpels 1-3, rarely more, distinct; stigma usually peltate. Fruit of 1-3 beries or capsules, usually indehiscent. —Genera 12. Species 200.—N. temperate regions, tropical mountains, S. America.

A. Stem O or erect. Flowers hermaphrodite. Carpel 1. Seeds usually small.
  I. Leaves unequally pinnate. Leaflets opposite .... MAHONIA.
  II. Leaves simple, fascicled in the axils of 3-5-partite, rarely simple spines .... BERBERIS.
  III. Leaves simple, palmate. Ovules many .... PODOPHYLLUM.
B. Glabrous hero with tuberous root. All the leaves radical ...... BONGARDIA.

Root and bark generally purgative ; bark bitter, tonic and antiperiodic, or depurative and cooling ; fruit sour, astringent antiscorbutic.

The following are among the products isolated :—(1) alkaloids—berbamine, berberine, oxyacanthine—; (2) resins—podophylloresin, podophyllotoxin—; (3) colouring matter—podophylloquercetin—; (4) acids—malic, citric—.

OFFICIAL :—*Berberis vlugaris* Linn. (France).

Podophyllum emodi Wall. (Great Britain); *P. peltatum* Linn.

(Belgium, Denmark, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States)=*P. callicarpum* Raf. (Portugal); *P. peltatum* Wild. (Austria Hungary).

Berberis (Tourn.) Linn.

Erect shrubs with yellow wood. Leaves simple, alternate or fascicled in the axils of 3-5-7 partite or rarely simple spines, entire or more often spiny-toothed. Flowers small, yellow, solitary fascicled, or in bracteate simple or compound racemes. Sepals 6, petaloid, imbricate in two whorls. Petals 6, impricate in two whorls, usually with 2 glands inside at the base. Stamens 6, free, dehiscing by ascending valves. Carpel 1. Fruit a berry, blue or red.—Spicies 190.—N. hemisphere, S. America.

A. Ripe fruit red. Inflorescence a simple raceme. Leaves usually toothed, lower pedicels 8—25 mm. long .... 1. *B. petiolaris.*
B. Ripe fruit blue black. Inflorescence a simple raceme.
  1. Leaves glossy green not glaucous beneath .... 2. *B. aristata.*
  2. Leaves pale glaucous beneath.
    a. Leaves 1.3—3.8 cm. broad, secondary nerves prominent above .... 4. *B. asiatica.*
    b. Leaves 7.5—18 mm. broad, secondary nerves not prominent above .... 3. *B. lycium.*

About forty species of *Berberis* are used medicinally and they all seem to have similar therapeutical properties. Their stems and barks are bitter tonics and mild laxatives.

There are three well-defined medicinal groups :—(1) The Rocky Mountain group, including *B. aquifolium* Pursh.; (2) the Asiatic group, which includes *B. aristata* DC.; (3) the European group, which includes *B. vulgaris* Linn.

The following deserve special mention in Europe— *B. aetnensis* R. & S., *B. vulgaris* Linn.—; in China—*B. sieboldii* Miq., *B. vulgaris* Linn.—; in Indo China—*B. asiatica* Roxb., *B. lycium* Royle, *B. japonica* R. Br., *B. vulgaris* Linn.—; in North America—*B. aquifolium* Pursh., *B. nervosa* Linn.—; in Central America—*B. trifoliatus* Moric.—.

Berberine has been isolated from *B. aetnensis, B. aquifolium,*

B. buxifolia, B. glauca, B. nervosa, B. vulgaris. Berbamine and oxyacanthine are contained in the root barks of *B. aquifolium* and *B. vulgaris.*

OFFICIAL :—The fruit of *B. vulgaris* Linn. in France.

1. **Berberis petiolaris** Wall. ex G. Don. Gen. Syst. I (1831) 116 ; Osmast. Fl. Kumaon (1927) 18.—*B. pachyacantha* Koehne Deutsch. Dendrol. (1893) 170.—*B. vulgaris* var. *vulgaris proper* Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I, 109.—PLATE 43 B (under *B. vulgaris*).

Deciduous, 2.4-3 m. high, twigs glabrous, spines usually simple, often wanting. Leaves 2.5-10 by 1.5-3.8 cm., ovate, obovate or oblong or oblong-lanceolate, thin, membranous, closely but rather irregularly toothed or entire, narrowed towards the base ; petiole distinct up to 1.3 cm. long. Racemes simple, lax, glabrous, exceeding the leaves, pendulous. Lower pedicels 10 mm. long. Fruit oblong-ovoid, red 7.5-10 mm. long; style very short; stigma large.

Distribution: W. Himalaya, from Kashmir to Nepal, up to 12,000 ft.

The root is cooling, tonic, cathartic, antibilious ; good for internal injuries, cough, and eye-sores ; good in diseases of the brain, hemicrania, paralysis, and rheumatism (Yunani).

In the Punjab, the root bark is used as diuretic, and for the relief of heat, thirst and nausea. It is astringent, refrigerant and antibilious. In small doses it is tonic, in larger cathartic. In the form of decoction, it is useful in scarlet fever and brain affections.

In Baluchistan the roots are boiled in water and the decoction given both to men and cattle for internal injuries (Hughes-Buller).

Arabic: Ambarbaris, Ambarusshahab—; *Baluchistan:* Karoskae, Koræ, Zrolg—; *Hattu :* Chamchur, Chochar—; *Jaunsar :* Chatrod—; *Persian :* Bedana, Cutch—; *Punjab :* Chachar, Chochar, Kashmal, Zirishk—; *Pushtu :* Karoskai—; *Urdu :* Ambar—;

2. **Berberis aristata** DC. Syst. II (1821) 8.—*B. aristata* var. *floribunda* Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I, 110.—*B. coriaria* Royle ex Lindl. Bot. Reg. XXVII (1841) t. 46.—PLATE 44.

A large deciduous shrub usually 1.8-3.6 m. high but attaining 4.5 m. with stem 20 cm. diam. Twigs whitish or pale yellowish

brown. Bark pale brown, closely and rather deeply furrowed, rough. Blaze 5-7.5 mm., bright yellow with coarse reticulate fibre. Leaves 3.8-10 by 1.5-3.3 cm., obovate or elliptic, entire or spinous-toothed, base gradually narrowed, with prominent reticulate nerves, glossy dark green above, glossy pale green but not glaucous beneath. Petiole 0 or distinct up to 4 mm. Infloresceme a simple drooping raceme, 2.5-7.5 cm. long, dense-flowered. Pedicels stout, 4-6 mm. long. Fruit 7-10 mm. long, ovoid, blue-black with a thick pale bloom ; style distinct.

Distribution: Himalaya from Chota Banghal to Nepal, 6,000—10,500 ft.

The wood, root-bark and extract of India Barberry have been used in Hindoo Medicine from a very remote period. Its properties are said to be analogous to those of turmeric. Indian Barberry and its extract, *rasot,* are regarded as alterative and deobstruent, and are used in skin diseases, menorrhagia, diarrhœa, jaundice, and above all in affections of the eyes. Sarangdhara recommends a simple decoction of Indian barberry to be given, with the addition of honey in jaundice. In painful micturition from bilius or acrid urine, a decoction of Indian barberry and emblic myrobalan is given with honey. A decoction of the root-bark is used as a wash for unhealthy ulcers, and is said to improve their appearance and promote cicatrization. *Rasot,* mixed with honey, is said to be an useful application to aphthous sores.

A decoction of the root bark in doses of one to two ounces was given to several patients for malarial fever and was found to be beneficial, the effect being very slow (Koman).

Arabic: Aargis, Ambarbaris—; *Bhutia:* Tsema—; *Canarese:* Bagisutra—; *English:* Indian Barberry, Tree Turmeric—; *Garhwal:* Kingora—; *Greek:* Lykion indikon—; *Hindi:* Chitra, Chotra, darhald, Kashmal, Kashmar, Rasvat—; *Jaunsar:* Kashmoi—; *Malayalam:* Maradarisina, Maramanjal—; *Nepal:* Chitra, Chutro—; *North-Western provinces:* Chitra—; *Persian:* Chitra, Zirishk—; *Punjab:* Chitra, Kasmal, Simlu, Sumlu—; *Sanskrit:* Daruharidra, Darvi, Kata, Katankati, Kateri, Pitadaru, Suvarnavarna—; *Simla:* Kammul, Kashmal, Kaumul—; *Tamil:* Mullukala, Usikkala—.

3. **Berberis lycium** Royle in Trans. Linn. Soc. XVII (1837) 94:—*B. Parkeriana* C. K. Schn. in Fedde Rep. Sp. Nov. XI (1912) 162.—Plate 43 a.

An evergreen shrub usually 1.2-1.8 m. high, but attaining 3.6 m. high and 10 cm. diam. Twigs pale yellowish, glabrous or minutely pubescent. Bark rough and rather deeply furrowed. Blaze 5 mm., bright yellow with coarse reticulate fibre. Leaves 2.5-7.5 by 0.7-1.8 cm., lanceolate or narrowly obovate-oblong, coriaceous, entire or with a few large spinous teeth, dull green above, pale and glaucous beneath, secondary nerves not prominent on the upper surface. Petiole 0 or distinct up to 2.5 mm. Inflorescence a simple raceme 13-38 mm. long, often with a few long-stalked flowers at the base. Pedicels slender, green, 5-13 mm. long. Fruit ovoid, 7 mm. long, blue; style distinct.

Distribution: Punjab Himalaya, 3,000-9,000 ft., Kumaon 2,500—8,500 ft.

Root bitter with an unpleasant taste; used in splenic troubles; tonic, a good febrifuge; intestinal astringent; good for cough, chest and throat troubles, eye-sores and itching of the eye, piles, and menorrhagia; useful in chronic diarrhoea; allays thirst; as a gargle strengthens the gums; a good application to boils (Yunani).

The root is highly esteemed as a febrifuge and as a local application in eye diseases.

An extract prepared by digesting in water sliced pieces of the root, stem, and branches, is called *rusot,* and is used advantageously in cases of ophthalmia.

The leaves are administered in Baluchistan as a cure for Jaundice (Hughes-Buller).

In Indo China the fruit is given as a tonic in troubles of the kidney.

The tincture was found to be useless as a remedial agent in fevers of malarial origin (Central Indigenous Drugs Committee).

Arabic: Ambarbaris, Hooziz, Hoozizindi—; Baluchistan: Karoski, Zarch—; *Cutch:* Kasmal—; *Hindi:* Chitra, Kushmul—; *Indo China:* Cau tu, Ky tu—; *Jaunsar:* Chatroi, Daruhaldi,

Kashmal—; *North-Wéstern Provinces:* Kushmul—; *Simla:* Chochar, Chotra, Kasmal—.

4. **Berberis asiatica** Roxb. ex DC. Syst. II (1921) 13; Roxb. Fl. Ind. III (1832) 182; Deless. Ic. Sel. II, t. 1.—PLATE 45.

An evergreen shrub, 1.2-1.8 m. high and stem up to 10 cm. diam. Bark rough, furrowed and somewhat corky. Twigs glabrous or shortly pubescent, pale yellowish. Leaves 2.5-6.3 by 1.3-3.8 cm. oblong, elliptic or broadly obovate, usually with large distant spinous teeth, sometimes entire, very coriaceous, dark green with very prominent primary and secondary pale reticulate venation above, glaucous beneath. Petiole 0 or distinct up to 10 mm. Inflorescence a simple raceme up to 3 cm. long, often with a few long-stalked flowers at the base. Pedicels 4-10 mm. long, slender, often glaucous. Fruit 7-10 mm. long, ovoid, blue-black with glaucous bloom; style distinct.

Distribution: Dry valleys of the Himalaya, from Garhwal to Bhutan 2,000—8,000 ft., Bihar, Mt. Abu.—Afghanistan.

The root has a bitter, sharp, hot taste; heals ulcers, urethral discharges, and diseases of the skin, the ear, and the eye; useful in leucorrhoea, ophthalmia, jaundice, diseases of the mouth, and fevers; an antidote to snake venom (Ayurveda).

Good in jaundice, eye sores, toothache, asthma, and skin pigmentation; dries unhealthy ulcers; as a fomentation removes inflamation and swelling (Yunani).

The plant is used for the same purpose and in the same ways as *B. aristata.* It is reputed useful in the treatment of snake bite and scorpion sting.

The root, stem, and gum are equally useless in the antidotal treatment of snake bite (Mhaskar and Caius) or scorpion sting (Caius and Mhaskar).

Bengal: Daruharitra—; *Canarese:* Maradarisina—; *Dehra Dun:* Kingora—; *Garhwal:* Kingora—; *Gujerat:* Daruhaldar—; *Hindi:* Daruhaldi, Sumlu—; *Jaunsar:* Kishornoi—; *Kumaon:* Kilmora, Kilmoru—; *Marathi:* Daruhaldi—; *Nepal:* Chitra, Kissie, Matekissie—; *Persian:* Darhuld, Daruhuld—; *Sanskrit:* Daruharidra, Darupita, Darunisha, Darvi, Dvitiyabha, Haimavati, Haridra, Hema-

kanti, Hemkranta, Kaliyaka, Kamini, Kapitaka, Karkatini, Karnavati, Kashtha, Kashtharajani, Katankateri, Marmmari, Nirdishta, Pachampacha, Parjani, Parjaniya, Pita, Pitachandana, Pitadaru, Pitadru, Pitatvaka, Pitika, Sthirraga—; *Simla:* Kammula, Kashmala, Kaumula—.

MAHONIA Nutt.

Characters of Berberis but leaves pinnate with opposite leaflets, and stamens usually 2-toothed below the anther.—Species 50.—S. hemisphere.

In North America the berries of *M. fascicularis* DC. are considered a cooling laxative medicine.

1. **Mahonia napaulensis** DC. Syst. II, 21.—*Berberis nepalensis* Spreng Syst. II, 120.

An evergreen shrub, 1.2—3 m. high with sparingly branched erect stems up to 20 cm. diam. Bark pale brown, rough and corky. Blaze bright yellow. Leaves pinnate, 18—45 cm. long, approximate at the ends of the stout twigs. Leaflets usually 7—17, 3.8—10 cm. long, ovate or lanceolate, acuminate, base of lateral pairs very oblique, margin coarsely and sharply spinous-toothed, coriaceous, glabrous, shining above, with 3-5 basal nerves prominent beneath. Flowers yellow, 5—6.5 mm. long, sweet-scented, in dense erect racemes 5—12.5 cm. long fascicled at the tips of the branches. Pedicles 1.25—4 mm. long. Berries 5—10 mm. long, ovoid, blue-black, glaucous; style distinct.

Distribution: Temperate Himalaya, 4,000—8,000 ft., from Garhwal to Bhutan, Khasia Hills 4,000—5,000 ft., Mergui, Nilgiri Mts. 5,000—8,000 ft.

The berries are considered diuretic, and demulcent in dysentery.

Garhwal: Gurm, Haldia—; *Jaunsar:* Khoru—; *Nepal:* Chatri, Jamnemunda, Milkissie—; *Punjab:* Amudanda, Chiror—; *Ramnagar:* Bankhilmana—.

PODOPHYLLUM Linn.

Scapigerous herbs; rootstock creeping, scaly, 2-leaved. Leaves peltate, palmately lobed. Flowers large, white or rose-coloured.

Sepals 3—6, petaloid. Petals 6—9 (rarely 4). Stamens as many or twice as many as the petals; anther-cells opening by slits. Ovary simple; stigma large, sessile, peltate; ovules many, on a broad ventral placenta. Fruit berried, many-seeded. Seeds obovoid, imbedded in pulp.—Species 5.—N. temperate regions.

The rhizome has purgative and cholagogue properties.

OFFICIAL:—The rhizome of and resin from *P. emodi* Wall. (Great Britain); the dried rhizome and roots of *P. peltatum* Linn. (Belgium, Denmark, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States)=*P. callicarpum* Raf. (Portugal), the resin from *P. peltatum* Wild. (Austria, Hungary).

1. **Podophyllum emodi** Wall. Cat. 814; Coventry Wild Fl. Kashmir (1923) 21, pl. XI; Blatter Beautiful Fl. Kashmir I (1927) 27, pl. 7, fig. 1 and 2.—PLATE 46.

A smooth, succulent, erect herb. Rootstock creeping. Flowering stem 15—45 cm. high, leafy on the upper portion. Leaves 1—3, usually 2, alternate, long-stalked, often purple-spotted, round, 15—25 cm. diam., deeply divided to the miiddle or base into 3—5 lobes, which are sharply toothed and often with deep incisions. Flowers 3.8—5 cm. diam., solitary, rarely 2, cup-shaped, white, sometimes pink, appearing at the same time as the leaves. Sepals 3, petal-like, soon falling off. Petals 6, Stamens 6. Fruit a large scarlet pulpy berry, 2.5—6.3 cm. in length, containing many seeds.

Distribution: Interior ranges of the Himalaya from Hazara and Kashmir to Sikkim.

The constituents of the Indian podophyllum and of the Amrican podophyllum (*P. peltatum* Linn.) are identical. The chief constituent is podophyllotoxin. An uncrystallizable resin, podophylloresin, has also been isolated.

The drug was administered in the form of a tincture to six cases and was found to possess all the properties that the podophyllin of the British Pharmacopœia possessed. It acts as a hepatic stimulant and cholagogue purgative (Koman).

Gujerat: Venivel—; *Hindi:* Bakrachimyaka, Bhavanbakra, Papra, Papri, Nibishi, Pilijati—; *Kashmir:* Banwangan—; *Marathi:* Padwel,

Patvel—; *Punjab:* Banbakri, Bankakra, Bankakri, Chimyaka, Chyakri, Gulkakri, Gulkakru, Kakra, Papri, Wanwangan—.

Bongardia C. A. Mey.

A glabrous herb. Root tuberous. All leaves radical. Calyx 3—6-sepalous, ebracteate. Petals 6, exapendiculate at the base, with a nectariferous pore; stamens 6; style short; stigma disciform, deeply lobate-placate. Ovules 5—6, basal with erect funicles. Capsule bladder-shaped, membranous, at the apex with irregular lobes. Seeds 1—4, globose, attached to the base. Embryo very small, at the base of fleshy albumen.—Species 1.—E. Mediterranean, Transcaucasus, Persia, Afghanistan, Baluchistan.

1. **Bongardia rauwolfii** C. A. Mey. Verz. Pfl. Cauc. (1831) 174.—*B. chrysogonum* Boiss. Fl. Or. I (1867) 99.

A glabrous herb with a tuberous root. Leaves all radical, pinnatisect, segments sessile, cuneate at the base, oblong, 3—5-fid at the tip, opposite or in the lower part of the leaf quaternately verticillate. No bracts. Sepals 3—6, Petals 6, no appendix at the base, but with a nectariferous pore. Stamens 6. Style short; stigma disciform, deeply lobate-plicate. Ovules 5—6 at the base; funicles erect. Capsule bladder-like, membranous, oblong, attenuate at both ends. Seeds 1—4, globose.

Distribution: Baluchistan.—Afghanistan, Persia, Transcaucasus, Syria, Palestine, Bithynia, Greek Islands.

In Baluchistan the leaves are used as a cure for sore eyes in horses (Hughes-Buller).

Ghandoba: Puccatutuka—; *Kotra:* Shrin—.

NYMPHAEACEAE.

Aquatic, perennial herbs, with a submerged rhizome. Leaves usually floating, rarely emersed, usually peltate, involute in verna-

tion, the submerged leaves never divided; petioles long. Flowers usually floating or sometimes emersed, handsome; scapes 1-flowered, naked; floral whorls all free, hypogynous or adnate to a fleshy disk which surrounds or envelopes the carpels. Sepals 3—5. Petals 3—5 or many. Stamens 6-many; anthers erect. Carpels 3 or more in one whorl, free or connate or irregularly sunk in pits of the disk; stigmas as many, peltate or decurrent. Ovules few or many, scattered over the walls of the cells, anatropous or orthotropous. Fruit emersed or maturing beneath the water, formed of the connate carpels, or of separate and indehiscent carpels, or of the enlarged, turbinate, flat-topped disk with the nut-like carpels sunk in its crown. Seeds naked or immersed in a fleshy or pulpous aril; albumen floury or 0; embryo enclosed in the enlarged amniotic sac.—Genera 8. Species 5.—Tropical and temperate regions.

A. Sepals and petals 3 each. Carpels free. Ovules few .... BRASENIA.
B. Sepals 4—6; petals and stamens indefinite. Carpels confluent with one another or with the disk into one ovary; ovules many
  1. Sepals, petals and stamens half-superior, inserted on the disk which is confluent with the carpels .... NYMPHAEA.
  2. Sepals, petals and stamens superior. Carpels sunk in the torus .... EURYALE.
C. Sepals 4—5; petals and stamens indefinite. Carpels irregularly scattered, sunk in pits of the turbinate disk .... NELUMBO.

Roots mucilaginous, farinaceous, demulcent, astringent; flowers narcotic.

Nupharine, an amorphous physiologically inactive alkaloid of unknown constitution, has been isolated from the fresh rhizome of *Nuphar luteum* Sibth. & Sm. The seeds of this same plant contain nuphar-tannic acid. The amino-acid, 1-asparagin, has been obtained from *Nelumbo nucifera* Gaertn.

BRASENIA Schreb.

There is only 1 cosmopolitan species, except in Europe.

1. **Brasenia sachreberi** J. F. Gmel. Syst. 853.—*B. peltata* Pursh Fl. Bor. Am. II (1814) 389.

A slender aquatic with creeping rootstock. Stem branched. Leaves 5—10 cm. long, alternate, peltate, floating; petioles and peduncles clothed with mucus. Flowers 2.5 cm. diam., red; peduncles axillary. Sepals 3, pubescent. Petals 3, linear. Stamens 12—18; anthers linear, slits lateral. Disk small. Ovaries 6—18, cylindric; stigma dilated, villous; ovules 2—3, pendulous from the walls of the ovary. Carpels coriaceous, indehiscent. Seeds albuminous.

Distribution: Bhutan, 6,000 ft., Khasia Hills, 4,500 ft.—E. N. America, E. Australia.

The leaves are astringent, and have been used in phthisis and dysentery in North America.

In Indo China the stems and leaves are ground and applied to boils and abscesses. The seeds, in decoction form, allay thirst, neutralise the effects of certain poisons, strengthen the gums: they are considered cooling, digestive, and anti-dysenteric.

China: Ch'un, Shui K'uei, Shun—; *Indo China:* Chuyen—; *Malaya:* Sooi kwai—.

NYMPHAEA (Tourn.) Linn.

Large aquatic herbs; rootstock creeping. Flowers large, floating, on long, radical scapes, expanded. Sepals 4, inserted at the base of the torus. Petals 12—28, in many series, the inner gradually transformed into stamens, all adnate to the base of the disk. Filaments petaloid, 40—60 in many series. Anthers narrow-linear; slits introrse. Ovaries many, immersed in a fleshy torus and combined with it, forming a many-celled ovary, crowned by the connate, radiating, furrowed stigmas; ovules numerous, anatropous. Fruit a soft spongy berry, ripening under water, bursting irregularly. Seeds minute, nesting in pulp, enclosed in a sac-like, fleshy aril, albuminous.—Species 40.—Tropical and temperate.

A. Flowers white, about 5—11.2 cm. diam. .... 1. *N. alba.*
B. Flowers red, pale rose or white, 7.5—20 cm. across........ 2. *N. rubra.*
C. Like rubra but leaves more densely pubescent beneath. Flowers smaller 7.5—10 cm. across .... 3. *N. pubescens.*
D. Flowers usually pale violet, less commonly blue or purple, 7.5—15 cm. diam. .... 4. *N. stellata.*

Acrid, astringent, demulcent and diaphoretic properties are attributed to this genus.

The following species are used medicinally in Europe—*N. alba* Linn.—; in Egypt—*N. caerulea* Sav., *N. lotus* Linn.—; in Guinea—*N. caerulea* Sav., *N. stellata* Willd.—; in Madagascar—*N. stellata* Willd.—; in China—*N. alba* Linn.—; in Indo China—*N. alba* Linn., *N. stellata* Willd., *N. tetragona* Giorgi—; in North America—*N. odorata* Ait.—.

1. **Nymphaea alba** Linn. Sp. Pl. (1753) 510.—*N. Cachemeriana* Cambess. in Jacq. Voy. Bot. II, t. 10; Coventry Willd. Fl. Kashmir (1923) 23, pl. XII.—PLATE 47.

Leaves rounded, cordate, entire, glossy, floating on the surface of the water with long, stout, flexible stems. Flowers white, about 5—11.2 cm. diam., solitary, floating on the surface of the water at the end of a long, stout, flexible, leafless stem. Sepals 4, green and brownish outside, white on inner surface. Petals about 10. Stamens many, the outer ones being transformed successively from petals to stamens. Anthers without appendages. Carpels many, the ovaries sunk in the fleshy disk, and with it forming a many-celled ovary crowned by a large stigma with 16 rays which have cylindrical appendages. Fruit a spongy berry ripening under water. Seeds buried in the pulp and each covered with a fleshy aril.

Distribution: Kashmir.—Siberia, Europe.

The mucilaginous and somewhat acrid root and stock are administered in some countries for dysentery. It is an astringent and slightly narcotic medicine.

The flowers are reputed to be anti-aphrodisiac. An infusion of the flower and fruit is given in diarrhœa and as a diaphoretic.

Akwapim: Ntanowa—; *Annam:* Kien thiet—; *Arabic:* Nilufar—; *Bombay:* Pandharenkamal—; *China:* Hung Pai, Lien Hua—; *Danish:* Soeblomster—; *Dutch:* Witte Zeebloem—; *English:* Lotus-lily, Water-rose, White Water-lily—; *French:* Baratte, Blanc d'eau, Burette, Crugeon, Herbe aux plateaux, Lis d'eau, Lis d'étang, Lune d'eau, Lunette d'eau, Nénuphar blanc, Grand nénuphar, Nymphe, Plateau ă fleurs blanches, Pyrote, Volant d'eau, Volet, Volet blanc—; *Ga:*

Tertermantrer—; *German:* Wasser Lilie, Weisse Seeblume—; *Greek:* Nymphaia, Sidi—; *Hausa:* Bado—; *Indo China:* Bach lieu tu, Hat sen trang—; *Irish:* Duilleoghuidhebhaitighe—; *Italian:* Carfano, Nenufaro bianco, Ninfea—; *Kashmir:* Brimposh, Kamud, Nilofar—; *Polish:* Grzybienie, Wodna lilia—; *Portuguese:* Nimphea branca—; *Roumanian:* Plumiera alba, Plumuna alba, Pluta, Nufar alb, Titva de apa—; *Russian:* Kubishka, Wodanoi lelei—; *Spanish:* Nenufar blanco, Ninfea blanca—; *Swedish:* Sjoeblad—.

2. **Nymphaea rubra** Roxb. ex Salisb. Parad. Lond. 1, sub t. 14; Fl. Ind. II, 576; Wight III. I. t. 10.—*N. lotus* Hook. f. & Th. Fl. Ind. 241, in Hook. f. Fl. Brit. Ind. I, 114 (non Linn.).

N. lotus Linn. does not occur in India.

Rootstock tuberous, short, erect, roundish. Leaves peltate, 15—25 cm. diam., orbicular or reniform (the younger subsagittate), deeply cordate at the base the sinus 6.3—7.5 cm. deep, sharply and irregularly sinuate-dentate, with very sharp hard teeth, glabrous and often nigro-punctate above, pubescent and prominently veined beneath; petioles very long, cylindric, submerged, glabrous or puberulous, inserted 12—18 mm. within the basal margin. Flowers solitary, 7.5—20 cm. across, red, pale rose, or white, open in the mornings only; peduncles very long, usually pubescent. Sepals oblong, obtuse, 5—10-ribbed. Petals about 12, oblong, obtuse, about thrice as long as broad. Stamens about 40; anthers without appendages; filaments much dilated at the base; pollen smooth. Stigmatic rays 10—20, with clavate appendages. Fruit 3 cm. diam., fleshy, globose, green, ripening beneath the water. Seeds ovoid, rough; aril white, transparent.

Distribution: Common throughout India in the warmer parts.

The flower has an acrid, bitter-sweetish taste; cooling; removes impurities from the blood; febrifuge; aphrodisiac; lessens bile, "vata" and "kapha;" allays thirst, cough, and vomiting (Ayurveda).

The powdered rootstock is given in dyspepsia, diarrhœa, and piles.

A decoction of the flowers is prescribed in palpitation of the heart

Arabic: Nulufar—; *Bengal:* Buroruktokumbal, Chotasundi, Nal, Raktakambal, Saluk, Shaluk—; *Burma:* Kiyani, Kyahphyu—; *Canarese:* Bilitavarai, Nyadalehuvu—; *Deccan:* Alliphul—; *Gujerat:* Kanval, Nilophal—; *Hasada:* Kombolba, Upalba—; *Hindi:* Chotakanval, Kanval, Raktachandana—; *Malayalam:* Ampala—; *Marathi:* Lalakamal, Raktakamal—; *Orissa:* Dhabalakain, Rangkain—; *Persian:* Nilufar—; *Sanskrit:* Alagandha, Alipriya, Alohita, Alpapatra, Aravinda, Arunakamala, Bhadra, Charunalaka, Hallaka, Indivara, Kalharamu, Kamala, Kokanada, Krishnakanda, Kumuda, Kunalaya, Nilotpala, Raktakairava, Raktakalhara, Raktakamala, Raktakumuda, Raktambhoja, Raktasandhyaka, Raktasaroruha, Raktavarija, Raktavarna, Raktotpala, Ravipriya, Rochana, Sandhyaka, Shonapadma, Somakhya—; *Sind:* Kuni, Puni—; *Sinhalese:* Olu, Otu—; *Tamil:* Allitamarai, Ambal—; *Telugu:* Allitamara, Errakaluva, Kalharamu, Koteka, Tellakalava—.

3. **Nymphaea pubescens** Willd. Sp. Pl. II, 1154.—*N. lotus pubescens* Hook. f. & Th. Fl. Ind. (1855) 241; in Hook. f. Fl. Brit. Ind. I, 114.—*Castalia pubescens* (Willd.) Blume Bijdr. 48.

Like *N. rubra*, but leaves more densely pubescent beneath. Flowers smaller, 7.5—10 cm. across. Sepals oblong-acute.

Distribution: All over India in the warmer parts.

The powdered root is prescribed for piles as a demulcent; also for dysentery and dyspepsia.

The flowers are astringent and cardiotonic.

Madras: Alli—.

4. **Nymphaea stellata** Willd. Sp. Pl. II, 1153; Wight Ic. t. 178. —*Castalia stellata* (Willd.) Blume Bijdr. 49.—Plate 49.

Rootstock ovoid, short, acute. Leaves peltate, 12.5—20 cm. diam., orbicular or elliptic (the younger sagittate), obtusely sinuate-dentate or entire, with a narrow sinus 5—7.5 cm. deep, glabrous on both surfaces, often blotched with purple beneath; petioles long, slender, submerged. Flowers solitary, 7.5—15 cm. diam., usually pale violet, less commonly light blue or purple, sometimes faintly fragrant, open all the day; peduncles long. Sepals many-veined, not

ribbed, oblong-lanceolate, acute or subobtuse, streaked with purple lines. Petals linear-oblong or lanceolate. Filaments 10—50, dilated at the base; anthers with a lingual appendage; pollen smooth. Stigmatic rays 10—30, without appendages. Fruit globular. Seeds longitudinally striate.

Distribution: Warmer parts of India.—Tropical Asia and Africa.

Sweet and fragrant; cooling; alterative; dispels biliousness, improves taste, strengthens the body, and promotes the growth of hair (Ayurveda).

In India the plant is used in the same ways and for the same purposes as *N. rubra.*

In Indo China the seeds are considered a powerful stomachic and restorative.

In Guinea the infusion of the roots and the stems is considered emollient and diuretic; it is taken against blennorrhagia and diseases of the urinary tract. A decoction of the flowers is considered narcotic and antiaphrodisiac.

In Madagascar the leaves are applied topically in erysipelas.

In Cambodia the maceration of the leaves is used as a lotion in eruptive fevers.

Bengal : Chotashaluk, Nilpodma, Nilsaphala, Nilsapla, Sundhi—; *Bijnor :* Bambher—; *Bombay :* Upliakamal—; *Burma :* Kyanyu—; *Cambodia :* Pralit—; *Ceylon :* Niltelolu, Ratutelolu, Sudatelolu—; *English :* Blue Water-lily ; *Gujerati :* Nilkamal—; *Hindi :* Lilophal, Nilkamal, Nilpadma—; *Hova :* Betsimihilana, Tantama, Tsiazonafo, Voahirana—; *Imerina :* Voalefoka—; *Indo China :* Cu sung nho, Khiem tuc—; *Madras:* Karunaydel, Nilotpalam—; *Malay:* Ati-ati payah, Kelipoh, Teratei Kechil—; *Malayalam :* Sitambel—; *Malinke :* Kuludion, Kulukulu—; *Marathi :* Krishnakamal, Poyani—; *Porebunder :* Kalakamal, Kamal, Kumtan—; *Sakalave :* Tatamo—; *Sanskrit :* Asitotpala, Indiwar, Kandota, Kandotha, Kuvalaya, Mridutpala, Nilakamala, Nilaliya, Nilambujanma, Nilapadma, Nilapatra, Nilotpala, Nilpankaja, Nilpatraka, Saugandhika, Utpala, Utpalaka—; *Sinhalese:* Manel, Monch—; *South*

Africa : Water-lily—; *Tagalog :* Lauas—; *Telugu :* Nitikulava—; *Uriya :* Subdikain—.

EURYALE Salisb.

Only 1 species.—S.—E. Asia.

1. **Euryale ferox** Salisb. in Kon. & Sims Ann. Bot. II (1806) 74 ; Roxb. Cor. Pl. III, t, 244 ; Bot. Mag. t. 1447 ; Blatter Beautiful Fl. Kashmir I (1927) 28, pl. 8, fig. 1.—*Anneslea spinosa* Roxb. ex Andr. Bot. Rep. X (1810) t. 618, Fl. Ind. II (1832) 573.—PLATE 50.

A densely prickly aquatic. Rootstock short. Leaves peltate, corrugate, ·3—1·2 m. diam., elliptic or orbicular, green above, downy, deep bluish purple beneath, with strong spiny ribs. Spines sharp-curved on the under and upper surfaces. Ribs dichotomously branched over the whole leaf. The leaf, while in bud, is curiously folded up and enclosed in an involucre, which bursts as the leaf expands. Petiole long, wavy, spiny. Flowers 2·5—5 cm. long, bright red inside, green and shining outside. Sepals 4, erect, inserted on the edge of the torus above the carpels. Petals numerous, violet, 3—5-seriate, shorter than the sepals. Stamens many, many-seriate, fascicled in eights ; filaments linear, pollen spherical, 3-nucleate. Ovary 8-celled sunk in the dilated top of the torus. Stigma sessile ; discoid, concave. Berry spongy, 5-10 cm. diam., crowned with persistent sepals. Seeds 8—20, from a pea to a cherry in size, much eaten roasted. Aril pulpy. Testa thick, black. Albumen mealy ; embryo small.

Distribution: Kashmir, Oudh, E. Bengal.—China.

Leaves good for rheumatism. Flowers white, pale, sticky ; tonic, aphrodisiac ; restrain seminal gleet ; binding action in dysentery. Speeds astringent ; tonic, better than flowers ; restrain seminal gleet, dispel nightmares ; good in dysmenorrhea (Yunani).

The seeds are much used for their tonic, astringent, and deobstruent properties.

Bengal : Makhana—;*China :* Ch'ien Shih—; *English :* Foxnut—; *Hindi :* Machana, Makhana—; *Indo China :* Ke dau, Khiem—;

Distribution: Throughout the warmer parts of India.—From Persia eastwards to Australia.

Nearly every part of the plant has a distinct name and economic use, and supplies one or more drugs.

INDIA :—1. *Ayurveda :*—The whole plant is sweet, cool, slightly bitter ; gives tone to the breast ; removes worms ; allays thirst, fever, biliousness, vomiting, and strangury.

The root is bitter ; it cures cough, and biliousness ; allays thirst, and is cooling to the body.

The stem is good in strangury, blood complaints, vomiting and leprosy.

The tender leaves are bitter, cooling ; useful in burning sensation of the body, thirst, strangury, piles, and leprosy.

The flower is sweet, and cooling ; it allays cough, thirst, blood defects, skin eruptions, and symptoms of poisoning ; good in fever, and biliousness ; beneficial to the eyes.

The anthers are cooling, aphrodisiac, astringent to the taste and in diarrhœa; remove "kapha" and "pitta;" sedative to the uterus; good in thirst, bleeding piles, inflammations, and poisoning ; cure ulcers and sores of the mouth.

The fruit is bitter and astringent, sweet and cooling ; removes thirst, blood impurities, "kapha" and "pitta," and foul breath.

The seeds are sweet and flavoury, astringent and slightly bitter, aphrodisiac, sedative to the pregnant uterus ; destroy "kapha" and "vata;" good astringent in diarrhœa and dysentery; strengthen the body ; useful in burning sensation of the body, vomiting, and leprosy.

The honey is an excellent tonic ; removes "tridosha ;" useful in diseases of the eye.

The plant in combination with other drugs is considered an antidote to snake (Charaka, Sushruta, Vagbhata, Brihannighantaratnakara, Sharangdharsamhita) and scorpion (Charaka, Sushruta, Rasaratnakara, Vaidyavinoda) venoms.

2. *Yunani:*—The root is diuretic ; it is good in throat troubles, chest pain, spermatorrhea, leucoderma, and small-pox.

The white flower is a good tonic for the heart and the brain ; allays thirst ; improves watery eyes ; good in bronchitis, and for internal injuries.

The seeds are cool, diuretic, tonic to the uterus, good in menorrhagia and leucorrhoea ; useful in fevers and in chest complaints.

3. *Modern Practice* :—The powdered root is prescribed for piles as a demulcent ; also for dysentery and dyspepsia. It is used as a paste in ringworm and other cutaneous affections.

The large leaves are used as cool bedsheets in high fever with much heat and burning of the skin. The milky viscid juice of the leaf and flower stalks is used in diarrhœa.

The flowers are used as an astringent in diarrhœa, also cholera, in fever and diseases of the liver ; and are also recommended as a cardiac tonic.

The seeds are used to check vomiting, and are given to children as diuretic and refrigerant. They form a cooling medicine for cutaneous diseases and leprosy, and are considered an antidote for poisons.

The filaments are considered astringent and cooling, useful in burning sensation of the body, bleeding piles and menorrhagia. In bleeding piles, the filaments of the lotus are given, with honey and fresh butter, or with sugar.

A sherbet of this plant is used as refrigerant in small-pox, and is said to stop eruption ; used also in all eruptive fevers.

In Ceylon an aqueous extract of the fresh rootstock of the white-flowered variety is given internally for snake bite, and is believed to be especially useful in the bites of the cobra (Roberts).

CHINA & MALAYA :—The long white rhizomes resemble a string of sausages, each about a foot long and separated from the others by a constricting fibre. It is these constricting fibres which are used in medicine and are credited with the property of restoring to health persons suffering from nervous exhaustion (Housie). Their special action is regarded as hæmostatic.

The flour of the root is used as an arrowroot by the Chinese.

It is given in diarrhœa and dysentery ; and it is the base of a diet for infants.

The dried red petals are used as a cosmetic application to the face to improve the complexion.

The carefully dried and yellow fragrant stamens are an astringent and diuretic remedy, and are used as a cosmetic. In Tongking they are employed for flavouring and improving the appearance of tea.

The seeds roasted and divested of their shells are a favourable article for dessert. Boiled or ground into flour the kernels form a valuable food and medicine.

The plumule, caulicle, or germinating embryo of the ripe seed is given to reduce high fever, and is useful in the treatment of cholera, hæmoptysis, and spermatorrhœa.

A syrup of the dried flowers was used in half ounce doses and was found to be efficacious in curing mild cases of dysentery (Koman).

No part of the plant is an antidote to either snake (Mhaskar and Caius) or scorpion (Caius and Mhaskar) venom.

Annam : Lien hoa, Sen—; *Arabic :* Karambeulma, Nilufer, Ussulnilufer—; *Bengal :* Kombol, Komol, Padama, Panma, Pudmapodu—; *Bijnor :* Besenda—; *Bombay :* Kamala, Kankadi—; *Burma :* Padungma—; *Cambodia :* Chhuk—; *Canarese :* Kamala, Tavaribija, Tavarigadde—; *China :* Lien, Lien Ou—; *Deccan :* Kungvel—; *English :* Chinese Water-lily, Egyptian Bean, Indian Lotus, Pythagorean Bean, Sacred Lotus—; *French:* Fĕve d'Egypte, Lis rose du Nil, Lotus sacré, Nénuphar de la Chine—; *Gujerati :* Suriyakamal—; *Hasada :* Kombolba, Upalba—; *Hindi :* Àmbuj, Kamal, Kanval, Lalkamal, Padam, Padam—; *Ilocano :* Sucao—; *Khandesh :* Dudhamaḷidakand—; *Konkani :* Salloc—; *Malayalam :* Bemtamara, Tamara—; *Marathi :* Kamal—; *Muzaffarnagar :* Pabbin—; *Persian :* Beykhneelufer, Nilufer, Nilufu—; *Poona :* Pandkanda—; *Porebunder :* Motunkamal—; *Portuguese :* Flor de loto, Nenuphar—; *Punjab :* Kanwalkakri, Pamposh—; *Sanskrit :* Abja, Ambhoja, Ambhoruha, Ambuja, Ambujanma, Ambupadma, Amburoha, Amlana, Arvinda, Asyapatra, Bisakusuma, Bisaprasuna, Drishopadma, Harivetra, Indiralaya, Jalajanma, Kamala, Kawar,

Kunja, Kusheshaya, Kutapa, Mahapadma, Mahotpala, Nala, Nalika, Nalina, Padma, Pankaja, Pankeruha, Pathoja, Pundarika, Pushkara, Putaka, Rajiva, Sahsrapatra, Sarojanma, Saroruha, Sarsija, Sarsiruha, Sharada, Sharapadma, Shatapatra, Shri, Shriparna, Shrivasa, Shuklapadma, Sitambuja, Sujala, Tumarasa, Vanashobhana, Varisoha—; *Sind :* Pabban—; *Sinhalese :* Nelumbo, Nelum—; *Tagalog :* Baino, Bayno—; *Tamil :* Ambal, Sivapputamarai, Tamarai—; *Telugu :* Kalung, Erratamara, Tamara—; *Urdu :* Nilufer—; *Uriya :* Padam—.

PAPAVERACEAE.

Annual to perennial herbs with coloured juice, rarely shrubs or small trees. Leaves alternate or the floral ones opposite or whorled, often much divided ; stipules 0 ; indumentum of simple or barbellate hairs. Flowers mostly solitary, showy, actinomorphic, hermaphrodite, visited by insects for pollen. Sepals 2—3, caducous or calyptrate. Petals 4—6 or 8—12, free, biseriate, imbricate, often crumpled. Nectaries 0. Stamens numerous, free ; anthers 2-celled, opening length-wise. Ovary superior, composed of 2 or more united carpels, 1-celled with parietal placentas, or several-celled by the intrusive placentas reaching the middle, rarely 2-celled by a spurious wall ; carpels rarely loosely united and becoming free in fruit ; stigmas opposite or alternate with the placentas ; ovules numerous, anatropous. Fruit capsular, opening by valves or pores. Seeds small, with a crested or smooth raphe or arillate ; embryo minute in copious fleshy or oily endosperm.—Genera 28. Species 600.—Chiefly N. temperate.

A. Capsule usually short, opening by short valves or pores.
   1. Stigmas 4 or more, radiating on a sessile disk .... PAPAVER.
   2. Stigmas 4—6, radiating from the top of a depressed style ARGEMONE.
   3. Stigmas 4—6, decurrent on the top of the style .... MECONOPSIS.
B. Capsule slender, transversely septate within, breaking up into joints or longitudinally 2-valved .... HYPECOUM.

The members of this Order have sedative, narcotic, stupefying, at times caustic and rubefacient, properties. The seeds are oleaginous, some emetic and cathartic.

The following substances are among the products isolated :—(1) alkaloids—α and β -allocryptopines, aporeidine, aporeine, berberine, chelerythrine, chelidonine, homochelidonine, codamine, codeine, cryptopine, dicentrine, glaucidine, glaucine, gnoscopine, lanthopine, laudanidine, laudanine, laudanosine, meconidine, morphine, pseudomorphine, narceine, narcotine, neopine, oxynarcotine, papaveramine, papaverine, protopapaverine, pseudopapaverine, protopine, rheadine, sanguinarine, thebaine, isothebaine, tritopine—; (2) bitter substances—chelidoxanthin, glaucopicrin, papaverosin—; (3) acids—erratic, fumaric, meconic, rhoeadinic, sulphuric, thebolactic—; (4) fixed oils ; (5) dyes ; (6) gums, resins, starch, mucilage ; (7) neutral principles—meconin, meconoisin, opionin—; (8) glucose sugar ; (9) cyanogenetic glucosides.

Official :—Codoine (Belgium, Denmark, France, Great Britain, Holland, Italy, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, United States) ;—hydrochloride (Austria, Holland, Hungary, Italy) ;—sulphate (United States) ;—phosphate (Belgium, France, Germany, Great Britain, Italy, Japan, Russia, Spain, Sweden, Switzerland, Turkey, United States).

Morphine (Portugal, Spain, United States) ;— acetate (Great Britain);—hydrochloride (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Russia, Spain, Sweden, Switzerland, Turkey, United States);—sulphate (Japan, United States) ;—tartrate (Great Britain).

Papaverine (Spain) ;—hydrochloride (Belgium, Germany, Holland, Italy, Spain, Sweden, Turkey).

Chelidonium majus Linn.=*C. umbelliferum* Stokes (Portugal).

Papaver Rhoeas Linn. (Austria, Belgium, France, Holland, Portugal, Spain, Switzerland, Turkey).

Papaver somniferum Linn. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Japan, Norway,

Portugal, Spain, Sweden, Switzerland, Turkey, United States) ;—var. *album* (France) ;—var. *album* DC. (Belgium, Portugal, Switzerland, United States)=*P. indehiscens* Dumort. (Portugal) ; —var. *album* Mill. (Italy) ;—var. *glabrum* Linn. (Russia).

PAPAVER Tourn ex Linn.

Annual or perennial herbs with milky juice. Leaves variously lobed or cut. Flowers on long peduncles. Ovary 1-celled ; stigmas adnate, radiating. Capsule short, opening by pores round the upper rim. Seeds small, pitted.—Species 110.—Europe, Asia, America, S. Africa, Australia.

A. Leaves 5-10 cm., all radical, obovate or oblong, pinnatifid. Flowers orange-yellow. Capsule obovoid, hispid .... 7. *P. nudicaule.*

B. Leaves 2-3-pinnatifid. Flowers 2.5-5 cm. diam., scarlet with a black disk. Capsule 13 mm. long, subglobose, hispid. Stigma convex, rays 4-8 .... 4. *P. hybridum.*

C. Leaves 1-2-pinnatifid. Flowers 7.5-10 cm. diam., scarlet; pairs of petals unequal. Capsule stalked. Stigma convex, rays 8-12 .... 1. *P. rhoeas.*

D. Leaves 1-2-pinnatifid. Petals scarlet in unequal pairs. Capsule obovoid, glabrous, sessile. Stigma 6-12-rayed ...... 2. *P. dubium.*

E. Leaves oblong, amplexicaul, lobed, 2-serrate. Flower large, white, purple or scarlet. Capsule 2.5 cm. diam., stalked, globose, glabrous. Stigmatic rays 5-12 .... 5. *P. somniferum.*

F. Leaves bipinnatisect with acute lobes. Petals pale scarlet. Capsule oblong-elliptical, sparingly beset with weak straight bristles .... 3. *P. argemone.*

G. Leaves subcoriaceous, hispid on both sides, pinnatipartite. Flowers large, more than 10 cm. across. Petals 4-6, all scarlet or at the base with a black violaceous spot. Capsule glabrous, glaucous, subglobose, about 2-3 cm. diam. Stigmatic rays 13-15 .... 6. *P. orientale.*

The flowers and flower heads are sedative ; the milky juice is narcotic, sometimes caustic. Every species of poppy yields opium to a greater or less extent.

The following are used medicinally :—in Europe—*P. alpinum* Linn., *P. argemone* Linn., *P. dubium* Linn., *P. hybridum* Linn., *P. somniferum* Linn.—; in Indo China—*P. somniferum* Linn.

OFFICIAL :—The petals of *P. Rhoeas* Linn. in Austria, Belgium, France, Holland, Portugal, Spain, Switzerland, Turkey.

Opium from *P. somniferum* Linn. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Japan, Norway, Portugal, Spain, Sweden, Turkey, United States),—var. *album* DC. (Belgium, Portugal, Switzerland, United States),—var. *album* Mill. (Italy),—var. *glabrum* (Russia).

The leaves and capsules of *P. somniferum* Linn. var. *album* (France),—var. *album* De Cand.=*P. indehiscens* Dumort (Portugal).

Capsules of *P. somniferum* Linn. (Austria, Hungary, Spain, Switzerland),—var. *album* DC. (Belgium).

Seeds of *P. somniferum* Linn. in France and Turkey.

1. **Papaver rhoeas** Linn. Sp. Pl. (1753) 507.—PLATE 52.

An erect, branched annual, 20-60 cm. high, with stiff spreading hairs or bristles. Lower leaves large, stalked, once or twice pinnately divided, the lobes lanceolate, pointed, and more or less cut. Flowers large, of a rich scarlet, with a dark eye, the filaments of the stamens not dilated. Capsule perfectly smooth, globular, or slightly top-shaped, with 8-12 stigmatic rays.

Distribution: Kashmir.—Tibet, Europe, W. Asia, N. Africa.

The medicinal properties of the plant are the same as those of *P. somniferum* (Ayurveda).

The leaves and seeds are good tonics useful in low fevers. The cooked roots are useful in rheumatism (Yunani).

The petals are sudorific, and they are used as a slight sedative.

The milk from the capsules is narcotic, and has slightly sedative properties.

A non-toxic alkaloid, rhoeadine, occurs in all parts of the plant.

Anglo Saxon: Chebole, Chesebolle, Chybolle—; *Arabic:* Khashkhashulsuda, Nabatulkhashkhash—; *Bengal:* Lalposht—; *Bombay:* Janglimudrika—; *Burma:* Bhainbinami, Bhinbinami—; *Canarese:* Kempugasgase, Kempukhasakhasi—; *Catalan:* Quicaraquichs, Rosella, Ruella—; *Chinese:* Li Ch'un Ts'ao—; *Deccan:* Lalkhaskhas—; *Dutch:* Heul Klaproos, Kankerbloem, Kolbloem, Roode Koorenbloem, Wilde Heul Klaproos—; *English:* Bledewort, Blind Eyes, Blindy Buff, Blindy-buffs, Canker, Canker Rose, Cheese-

bowl, Cockrose, Cock's-comb, Collin-hood, Copper-rose, Cop Rose, Corn Flower, Corn Poppy, Corn Rose, Cuprose, Cusk Darnel, Ear-aches, Fireflout, Head Ache, Head Poppy, Head Wark, Joan Silver-pin, Lightnings, Maws, Poison Poppy, Pope, Red Weed, Ridweed, Scarlet Poppy, Soldiers, Thunder Bolts, Yedwark—; *French:* Babiot, Babiou, Babot, Babou, Cornrose, Confanon, Coprose, Coq, Coq ponceau, Coquelicot, Coquelicot-pavot, Gravelotte, Gueringuingo, Mahon, Moine, Onder, Pavot coq, Pavot-coquelicot, Pavot des champs, Pavot rouge des champs, Pavot rouge sauvage, Ponceau, Rose de loup—; *German :* Ackerschnalle, Blatsblume, Blutmohn, Boschblume, Fallblume, Feldmangenblume, Feldmohn Feldrose, Feuerblume, Feuer-mohn, Flattermohn, Flitschrose, Gaublume, Glatschen, Glatzenblume, Glitsche, Grimmagblume, Haferkrautblaum, Halsrose, Hirnschal-blume, Hirnschnalz, Jammerblume, Juffer, Klapperrose, Klatsch-mohn, Klatschrose, Kohlrose, Kokeschblume, Koklico, Koleblume, Kornmohn, Rote Kornrose, Maagsamen, Makufken, Wilder Mohn, Paterblume, Pflappenrose, Pugerlitze, Schnallen, Schnellerblume, Windmohn—; *Greek:* Roias—; *Gujarat:* Lala, Lalkhaskhas—; *Hindi :* Lal, Lalpost, Post, Postekebija—; *Hungarian :* Mak—; *Italian :* Bambagella, Bubboline, Citole, Papavero selvatico, Papavero serchione, Rosolaccio, Scitole—; *Languedoc :* Graousella, Graouselle, Roalo, Rouzello ; *Malayalam :* Chovannakashakasha—; *Malta :* Corn Poppy, Poppy, Papavero, Rosolaccio, Pepprin—; *Marathi:* Tambada-khasakhasa—; *Persian:* Gulelalakebija, Khashkhashsiyah, Kokna-resurkh—; *Polish:* Maczek—; *Portuguese:* Papoila, Papoila vermelha, Papoula—; *Roumanian :* Mac iepuresc, Mac rosiu, Paparoane, Paparuna—; *Russian :* Mak samosyika—; *Sanskrit :* Raktapostavri-kshaha—; *Spanish :* Adormidera silvestre, Amapola, Arabol—; *Tamil:* Siguppuppostaka, Sivappugashagasha—; *Telugu:* Erragas-sagassala, Errapostakaya—; *Turkish :* Gelincik—; *Urdu :* Gulela-lakebija, Khashkhashsiyah—.

2. **Papaver dubium** Linn. Sp. Pl. (1753) in append. 1196. Nearly glabrous; stems 0.4-0.6 m.; juice milky. Leaves sessile, 7.5-15 cm., pinnatifid, segments lobed, acute. Buds ovoid, nod-ing. Flowers 2.5-5 cm. diam., terminal on long bristly stalks.

Sepals 2, ovate. Petals 4, in unequal pairs, crumpled in bud, red with a dark spot at the base, soon falling off. Ovary more or less divided by about 6 ovule-bearing partitions projecting inwards nearly to the centre of the cavity ; style none ; stigmas as many as the partitions, linear, adnate to the convex top of the ovary and radiating from its centre ; ovules numerous. Capsule glabrous, narrowly oblong, 1.9-2.5 cm., opening by pores close under the projecting rim of the stigmatic disk. Seeds numerous, small, kidney-shaped, minutely netted.

Distribution: W. Himalaya from Hazara to Kashmir and Garhwal.—Afghanistan, W. Asia, Europe, N. Africa.

The petals are sudorific.

Two alkaloids, aporeine and aporeidine, have been isolated from this plant. The former is described as a tetanising poison similar to thebaine.

English: Pale-red Poppy, Smooth long-headed Poppy—; *Malta:* Long-headed Poppy.

3. **Papaver argemone** Linn. Sp. Pl. (1753) 506.

Annual, setulose. Leaves bipinnatisect, with acute lobes. Stem elongated, erect. Petals pale scarlet. Capsule oblong-elliptical, sparingly beset with weak, straight bristles. Disk a little narrower than the capsule.

Distribution: Cultivated in Indian gardens.—Indigenous in Europe, Mediterranean.

In Spain an infusion or a syrup of the petals is much esteemed as a sudorific.

English : Rough-headed Poppy, Rough long-headed Poppy.

4. **Papaver hybridum** Linn. Sp. Pl. (1753) 606.

An annual herb. Setulose. Leaves bipinnati-partite, with linear segments. Petals vinous-red. Capsule ovate-globular, copiously beset with strong, needle-like, curve bristles. Disk one-third as broad as the capsule.

Distribution: Punjab, Jhelum Valley.—Afghanistan, Central and W. Asia, Europe, N. Africa.

The petals are diaphoretic.

The species contains the non-toxic alkaloid rhoeadine and another base.

English : Rough-headed Poppy, Rough round-headed Poppy—; *Malta :* Rough Poppy, Pepprin.

5. **Papaver somniferum** Linn. Sp. Pl. (1753) 508.—PLATE 53.

An erect annual, of a glaucous green, glabrous, or with a few hairs on the peduncle, scarcely branched, about 0·6 m. high or more. Leaves clasping the stem by their cordate base, oblong, irregularly toothed, and slightly sinuate or lobed. Flowers large, usually of a bluish white, with a purple base or white, purple or variegated. Filaments slightly dilated at the top. Capsule large, globular, and glabrous.

Distribution: It is doubtful whether the plant has ever been found wild. Cultivated in warm and temperate regions of Asia, Europe and N. Africa.

The plant is astringent, stimulant, fattening, aphrodisiac, tonic ; it beautifies the complexion, increases "kapha," diminishes "vata" and "pitta."—. Fruit with bitter and acrid taste cooling, binding ; increases "vata," destroys "kapha ;" allays cough ; intoxicating, causing excitement, leading to delirium ; anaphrodisiac when freely indulged in.—. The seeds are tonic, aphrodisiac, sweet, constipating ; destroy "vata" (Ayurveda).

Fruit sweetish, astringment, diuretic ; enriches the blood and strengthens the body ; helps digestion ; good in dysentery, in cough and in complaints of the chest, in fever, in anæmia ; cooling, maturant ; hypnotic, narcotic ; harmful to the brain (Yunani).

Opium in combination with other drugs is recommended for the treatment of snake bite and scorpion sting (Charaka).

Poppy heads are used in China for diarrhœa, dysentery, and all kinds of fluxes. The seeds ground in cold water are given in diarrhœa and dysentery.

In Indo China the roasted seeds are considered tonic.

Opium, the inspissated milky juice obtained by incision from the immature capsule, is not an antidote to snake venom (Mhaskar

and Caius), and is useless in the treatment of scorpion sting (Caius and Mhaskar).

Arabic : Abunom, Afiun, Bizrulkhashkhash, Khashkhashulbaiza, Qishrulkhashkhash—; *Bengal :* Pasto, Post—; *Bombay :* Aphim, Appo, Khaskhas, Post—; *Burma :* Bhain, Bhainzi—; *Canarese :* Afim, Biligasgase, Gasagase, Khasakhasi—; *Catalan :* Cascall—; *Chinese:* Ying Tzu Su—; *Danish:* Valmue—; *Deccan:* Afim, Khashkhash—; *Dutch :* Heul, Slaapkruid—; *English,* Bale-wort, Carnation Poppy, Joan Silverpin, Opium Poppy, Peony Poppy, White Garden-poppy, White Poppy—; *French:* Pavot, Pavot blanc, Pavot des jardins, Pavot ă opium, Pavot somnifĕre—; *German:* Mahn, Saatmohn, Schlafmohn—; *Greek:* Agria, Mikon hymeros—; *Gujarat:* Aphina, Khuskhus, Posta—; *Hindi :* Afin, Afyun, Kashkash, Pest, Post, Postekebij—; *Indo China:* A phien, A phu dung, Co tu tuc—; *Italian :* Papavero, Papavero domestico—; *Kachhi :* Doda, Post—; *Kumaon :* Posht—; *Malaya :* Bungapion, Yin soo hock—; *Malayalam:* Afiun, Kashakasha—; *Malta:* Opium Poppy, Poppy, Papavero, Pianta da oppio, Papavru, Xahxieh—; *Marathi.:* Aphu, Khuskhus, Posta—; *Nepal :* Aphim—; *Oudh :* Posta—; *Persian :* Afiun, Khashkhash, Khashkhashsufaid, Koknar, Postekoknar, Tukhmekoknar—; *Portuguese :* Dormideira, Papoula branca—; *Punjab :* Afim, Doda, Khashkhash, Khishkhash, Post—; *Roumanian :* Mac, Mac somnisor, Somnisor—; *Russia :* Mak snotvornyi—; *Sanskrit :* Ahifen, Chosa, Khasa, Khakasa, Ullasata—; *Sinhalese :* Abin—; *Spanish :* Adormidera, Dormidera—; *Swedish :* Vallmo—; *Tamil:* Abini, Gashagasha, Kasakasa, Postaka—; *Telugu:* Abhini, Gasagasala, Gasalu, Kasakasa—; *Turkish :* Hashash—; *Urdu :* Khashkhashsufaid—.

6. **Papaver orientale** Linn. Sp. Pl. (1753) 508 ; Bot. Mag. (1787) t. 57.

An erect herb, 60-90 cm. high, covered with rigid white bristles. Stem 1-flowered. Leaves subcoriaceous, hispid on both sides, pinnatipartite, lobes oblong-lanceolate, serrate. Flowers large more than 10 cm. across. Sepals 2, sometimes 3, concave, in the upper part cucullate, white outside, whitish inside, imbricate. Petals 4-6,

obovate-dilatate, 5-6 cm. long, all scarlet or at the base with a black-violacious spot. Filaments broadened above, black-purple ; anthers large, oblong, violaceous. Capsule glabrous, glaucous, subglobose, opening by subrotund valves, ca. 2-3 cm. diam. Disk obtusely dentate on margin; stigmatic rays 13-15, violaceous, papillose. Seeds orbicular-reniform, brown, broadly striate, foveolate.

Distribution: Cultivated in Indian gardens.—N. Persia, Armenia, Mediterranean.

The petals are sudorific.

A series of alkaloids have been isolated from the plant : thebaine, isothebaine, glaucidine, two phenolic bases, and one non-phenolic base.

7. **Papaver nudicaule** Linn. Sp. Pl. (1753) 507 ; Blatter Beautiful Fl. Kashmir I (1927) 28, pl. 8, f. 2 & 3.

A caespitose herb. Leaves all radical, petiolate, subglaucous, more or less hairy, pinnatifid or pinnatipartite or more rarely pinnatilobed, 3-15 cm. long including the petiole. Scapes single or several, 5-30 cm. long, terete, 1-flowered, setose-pillose. Buds ovoid or ovate-globose, more or less densely pilose, mostly nodding. Flowers scented, 2-5 cm. across. Petals: 2 outer ones larger than the 2 inner ones, obovate, with the margin subsinuate-crenulate, white with the claw yellow, or orange with the claw green, or orange-red, 1.5-3 cm. long. Filaments subulate, yellowish or olive; anthers oblong, pale yellow or saffron-yellow. Capsule oblong or obovate-globose, hispid, very rarely glabrous, 0.75-1.5 cm. long. Disk deeply crenulate. Stigmatic rays 4-6. Seeds minute, reniform-clavate, narrowly striate, foveolate.

Distribution: W. Himalaya, up to 17,000 ft.—Afghanistan, N. Asia, Central and N. Europe.

The flowers and the capsules are mildly diaphoretic.

ARGEMONE Tourn ex Linn.

Branching, glaucescent herbs with yellow juice. Leaves inciso-pinnatifid, usually spinoso-dentate or rigidly setose. Flowers handsome, terminal, white or yellow; buds usually erect. Sepals 2-3. Petals 4-6. Stamens indefinite. Ovary 1-celled; ovules many, on

4-7 parietal, filiform placentas; style scarcely any; stigma 4-7-lobed. Capsule oblong, short, dehiscing at top by short valves alternating with the stigmas and placentas. Seeds many, scorbiculate, not crested.—Species 12.—Tropical America.

A mexicana Linn. is used medicinally in every country where it is found growing.

1. **Argemone mexicana** Linn. Sp. Pl. (1753) 508 ; Bot. Mag. (1794) 243.—PLATE 54.

Glabrous, glaucous. Stems 0.3-1.2 m., prickly, branching. Juice yellow. Leaves thistle-like, stem-clasping, oblong, 7.5-18 cm., sinuately pinnatifid, spinous veins white. Flowers yellow, 2.5-5 cm. diam., terminal on short, leafy branches. Sepals 3, prickly, ovate, produced just below the tip in a short, horn-like excrescence. Petals 6. Ovary prickly, 1-celled ; stigma sessile, 4-6-lobed; ovules numerous, borne on the walls of the cavity. Capsule prickly, oblong-ovoid, 2.5-3.8 cm., opening by 4-6 valves. Seeds numerous, globose, netted.

Distribution: Introduced and naturalized throughout India up to 5,000 ft.—Indigenous in tropical America.

The plant is bitter, diuretic, purgative, destroys worms ; cures itching, leprosy, various skin diseases, inflammations, and bilious fevers ; useful in strangury ; an antidote to various poisons. The root is an anthelmintic ; its juice used as a collyrium cures ophthalmia and opacities of the cornea.—. The seeds are purgative and sedative ; fresh they cause vomiting, but age affects their activity (Ayurveda).

The plant has a bitter sharp taste ; enriches the blood ; a good expectorant and aphrodisiac ; useful in skin diseases and leucoderma (Yunani).

The root is an alterative. It is used in Nigeria as a stimulant.

The use of the root is attended with benefit in some chronic cases of skin diseases. In La Reunion it is given as a decoction in blennorrhagia.

On the Gold Coast the roots are used to cure guinea worm affections. They are ground up and mixed with onions and applied to the affected part. This is said to bring the worm out at once.

In La Reunion the stem is considered diuretic.

The Mandingos of the Gambia use an infusion of the leaves for coughs.

The seeds are laxative, emetic, nauseant, expectorant and demulcent. They are useful in cough and catarrhal affections of the throat and pulmonary mucous membrane, and in pertussis and asthma. Though they do not appear to possess any anti-spasmodic property, they have a distinct control over asthma, apparently from their combined actions of nauseant, emetic, expectorant and demulcent. As their use is often accompanied by more or less vomiting and nausea, they are as a laxative medicine more suited to some pulmonary affections than to other diseases.

In Mexico the seeds are considered an antidote to snake venom.

The seeds yield on expression a fixed oil, which has long been in use amongst West India and West Africa practitioners as an aperient. Applied to herpetic and other forms of skin disease, it is reported to exercise a well-marked soothing influence. It is serviceable in some cases in which jalap, rhubarb and castor-oil are indicated, and also in some bronchial and catarrhal affections.

The smoke of the seeds is used in Delhi to relieve toothache. It is also said to be useful in caries of the teeth.

The yellow juice of this plant is used as a medicine for dropsy, jaundice, and cutaneous affections. It is also diuretic, relieves blisters, and heals excoriations and indolent ulcers. It is held in much esteem as a local application to indolent and ill-conditioned ulcers. It is also used as an external application to the eyelid in conjunctivitis. In the Konkan, the juice with milk is given in leprosy.

In French Guiana the seed is used as a cathartic and an emetic. The stem and root in decoction are prescribed for vesicular calculus. The flowers are considered narcotic.

The seeds are not an antidote to snake venom (Mhaskar and Caius).

The alkaloids of *A. mexicana* have been correctly indentified as berberine and protopine (A. C. Santos and P. Adkilen; *Journ. Am. Chem. Soc.*, July, 1932).

Annam: Ca gai—; *Ashanti:* Akusiribie—; *Bengal:* Baroshialkanta, Shialakontha, Shialkanta, Siakanta—; *Brazil :* Cardo santo—; *Burma :* Khyaa—; *Canarese :* Balurakkisa, Datturi, Datturigidda, Mulludaturi, Parangidatturi—; *Cape Peninsula :* Bathurst Burweed, Steekbossie—; *Chinese :* Lao Chou Li—; *Deccan :* Bharamdandi, Daruri, Farangidhatura, Pila, Piladhatura—; *English :* Mexican Poppy, Prickly Poppy, Yellow Mexican Poppy—; *French :* Chardon bénit des Antilles, Figuier infernal, Pavot épineux, Pavot massue, Pavot du Mexique, Tache de l'oeil—; *French Guiana :* Argémone—; *Fulah:* Hakorinkada—; *German:* Stachelmohn—; *Gujarat:* Darudi—; *Hasada:* Rangainijanum—; *Hausa:* Hakorin kada, Ka ki ruwan Allah, Ya ki ruwan Allah—; *Hindi:* Bharbhand, Biladhutura Brahmadundi, Brahmi, Farangidhutura, Satiyanashi, Shialkanta, Suchianas, Ujarkanta—; *Ilocano:* Cachumba, Chicalote, Casubangaso, Casubhangaso—; *Indo China:* Lao thu lac—; *Kano:* Kwarko, Kwarkoro—; *Kathiawar:* Darudi—; *Konkani:* Firingidutro, Redonoxi—; *La Reunion:* Chardon—; *Malayalam:* Brahmadanti—; *Marathi:* Daruri, Firangidhotra, Kantedhotra, Kontedhotra, Pinvaladhotra—; *Mexico :* Cardo santo, Chicalotl, Figo del inferno—; *Mundari :* Bakulajanum—; *North-Western Provinces :* Bharbhurwa, Kantela, Karwah—; *Portuguese :* Figo do inferno—; *Punjab :* Bhatkateya, Bhatmil, Bherband, Kandiari, Katsi, Satyanasa, Sialkanta—; *Sanskrit :* Brahmadandi, Hemadugdha, Hemashikha, Hemavati, Hemavha, Kanchanakehiri, Kanchani, Karhini, Katuparni, Kshirini, Patuparni, Pitapushpa, Rukmini, Srigalakanta, Suvarna, Svarnadagdha, Svarnakshiri, Svarnavha, Tiktadugdha, Yavachincha—; *Santal :* Gokhulajanum—; *Spanish :* Adormidera espinosa, Figo del inferno—; *Suto :* Nthswantsane, Sehlohlo-se-seholo—; *Tagalog :* Diluario, Duluario—; *Tamil :* Bramadandu, Kurukkum—; *Telugu :* Brahmadandi—; *Twi :* Aransemmenyan—; *Urdu :* Baramdandi—; *Uriya:* Kantakusham—; *Yoruba:* Kada ka taba yaro—.

MECONOPSIS Vig.

Perennial herbs ; juice yellow. Leaves entire or lobed, or more rarely pinnatified or pinnatisect. Flowers solitary or in racemose

cymes or paniculate, or very rarely umbellate, large, yellow, purple or blue. Sepals 2. Petals 4, or 5-9. Stamens numerous. Style sometimes almost absent, mostly very distinct ; stigma clavate or depressed-dilatate, the lobes contiguous, decurrent or 4-8-radiating, rarely more, alternating with the placentas. Capsule oblong or obovate or clavate or rarely narrowly cylindric, sometimes flattened out at the base of the style into an astigmatic disk, glabrous or hirsute or setose, dehiscing at the apex by subrotund operculate pores or by valves below the persistent style. Seeds scrobiculate, raphe cristate or naked.—Species 30.—N. temperate region.

1. Radical leaves linear-oblong or lanceolate, remotely and irregularly pinnatifid-lobed .... 1. *M. aculeata.*
2. Radical leaves pinnatipartite .... 2. *M. napaulensis.*

The genus is credited with powerful narcotic and poisonous properties.

1. **Meconopsis aculeata** Royle Ill. Bot. Himal. (1839) 67, t. 15 ; Hook. Bot. Mag. (1864) t. 4556 ; Blatter Beautiful Fl. Kashmir I (1927) 29, pl. 8, fig. 4 and frontispiece.—*M. nepalensis* Honigberger Thirtyfive Years in the East II (1852) t. 15.—PLATE 55.

A subglaucous herb, 30-60 cm. high, with short scattered prickles. Radical leaves linear-oblong, remotely and irregularly pinnatifid-lobate, with scattered rigid prickles on both sides, rarely glabrate, long-petioled, 10-20 cm. long including the petiole, 2.5-4 cm. broad; the stem-leaves narrower with shorter petioles or sessile. Flowers on short slender pedicels, 4-7 cm. diam., forming racemose cymes. Buds subglobose, about 1 cm. diam. Sepals glabrous, aculeate. Petals 4, broadly obovate or obcuneate-rotund, purplish blue or greyish steel-blue or scarlet (in Royle's Ill.). Anthers shortly oblong. Stigma shortly conical. Capsule broadly obconical, oblong or obovate, rarely clavate, twice as long as the style, 2.5 cm. long including the style, setose-echinate, 5-7-valved, opening at the apex, torus scarcely widened.

Distribution: Kashmir, Garhwal, Kumaon, 11,000—15,000 ft.

The plant, especially the root, is considered narcotic and poisonous.

Jhelum : Guddikum—; *Kumaon :* Kanda—; *Ravi :* Gudi—; *Simla :* Kanta—; *Sutlej :* Kanada—.

2. **Meconopsis napaulensis** DC. Prodr. I (1824) 121.—*M. Wallichii* var. *fusco-purpurea* Hook. f. Bot. Mag. (1884) t. 6760.—*M. Wallichii* Hook. Bot. Mag. (1852) t. 4668 ; Prain in Ann. Bot. XX (1906) 360 pl. XXIV, fig. 6.—Plate 56 & 57.

A glaucescent herb, laxly hairy and rarely substellately pubescent. Stem 0.6-1.5 m. high, 1-2.5 cm. thick at the base. Basal leaves pinnatipartite, stem-leaves pinnatifid or lyrate-pinnatisect, covered with barbellate hairs and stellate indumentum, radical and lower leaves petiolate, upper ones sessile, the uppermost pinnatilobed or subcrenate-dentate. Flowers in simple or paniculate cymes, nodding, 6-8 cm. diam. Buds broadly ovoid, 1-2 cm. long. Sepals laxly strigose and densely stellate-tomentose. Petals broadly obovate-oblong, obscurely fuscous-purple or pale blue, ca. 2.5 cm. long. Capsule subcylindric or narrowly ovate, 5-7-valved, dehiscing at apex, first with yellow appressed bristles, then densely covered with reddish spreading or reflexed hairs, 1.25-2.5 cm. long; style slender, elongate, subcylindric, 1.25-2 cm. long; stigma capitate.

Distribution: Nepal and Sikkim, 9,000—10,000 ft., Bhutan.— Sze-chuan.

The root is used as a narcotic in Kashmir.

Hypecoum Tourn. ex Linn.

Low annual herbs, more or less glaucescent, mostly glabrous, with a watery and hyaline juice. Radical leaves pinnatipartite with pinnatifid or pinnatisect segments ; floral leaves mostly similar. Flowers small ; inflorescence dichasial. Sepals 2, small. Petals mostly yellow, 4, in 2 series, the 2 outer mostly 3-lobed, rarely entire, cuneate at base, the 2 inner 3-fid, lateral lobes narrow, midlobe mostly concave. Stamens 4, filaments more or less winged. Capsule siliquiform, mostly a lomentum more or less articulate-nodose divided by transverse septa into perfect cells, separating into 2 valves. Seeds ovate, thinly granulate, rarely subquadrangular.—Species 18. —Mediterranean, Central Asia.

Therapeutically the genus is of no importance.

1. **Hypecoum procumbens** Linn. Sp. Pl. (1753) 124 ; Lam. Encycl. Méth. III (1791) t. 88.—PLATE 58B.

A glabrous many-stemmed herb, flower-bearing stems ascending or decumbent, only at the apex dichotomously branching. Leaves glaucous-green, the basal ones 5-15 cm. long, bipinnatifid, lobes linear-lanceolate or lanceolate, acute, and mostly entire, the floral ones few and multipartite from the base with linear segments. Scapes many, dividing at the apex into 2-5 one-flowered pedicels which are first cymose-umbellate and then cymose, 10-20 cm. long. Flowers 0.5-1.5 cm. across. Sepals ovate or ovate-lanceolate, acute, yellowish green, deciduous, sometimes denticulate towards the apex, much shorter than the petals. Petals yellow, 2 outer ones oval-oblong, on both sides provided with a small lobe arising from the cuneate base, the 2 inner ones narrower, much shorter, trifid beyond the middle, lateral teeth obtuse, middle one stipitate, concave, ciliate. Anthers oblong-linear, 1 mm. long ; filaments membranous-winged, sublanceolate. Lomentum erect, arcuate, compressed, longitudinally striate, acuminate, articulate-nodose, 4-6 cm. long, at last breaking up into 1-seeded joints. Seeds costate.

Distribution: Peshawar, Multan, Salt Range, Baluchistan.—W. Asia, Mediterranean.

The juice has the same effect as opium. The leaves act as diaphoretic (Murray).

In Bavaria the plant is used as a tonic aperient, and sudorific.

English : Horned Cumin—; *Italian :* Cornacchina de grani, Cornacchina verdemare—; *Malta:* Cornacchina, Karn il Moghza—.

FUMARIACEAE.

Herbaceous with brittle stems and watery, juice, sometimes scandent. Leaves radical, alternate or rarely subopposite, usually

much-divided. Flowers hermaphrodite, often zygomorphic. Sepals 2, small, deciduous. Petals 4, imbricate, more or less connivent, the 2 outer often saccate or spurred at the base, the 2 inner narrower and sometimes coherent to the apex. Stamens 4, free and opposite the petals, or 6 and united into 2 bundles. Ovary superior, 1-celled with 2 parietal placentas; style slender; ovules 1 to many, anatropous. Fruit capsular or a nut, capsule sometimes transversely septate and breaking into 1-seeded indehiscent segments or dehiscing by valves. Seeds shining, crested or nude ; endosperm fleshy with minute embryo.—Species about 260.—Mainly N. temperate zone.

1. One outer petal spurred; capsule many-seeded .... CORYDALIS.
2. One outer petal spurred; fruit indehiscent, nut 1-seeded .... FUMARIA.

Slightly bitter, tonic, aperient, and diaphoretic.

The following have been isolated from members of the Order :—(1) alkaloids—bulbocapnine, corybulbine, isocorybulbine, corycavamine, corycavidine, corycavine, corydaline, dehydrocorydaline, corydine, corypalmine, corytuberine, dicentrine, fumarine, protopine, sanguinarine, d-tetrahydropalmatine—; (2) acids—fumaric.

OFFICIAL:—*Fumaria capreolata* Linn. var. *α-vulgaris* Machado (*F. capreolata* Vandelli) and var. *β-bastardi* Machado (*F. officinalis* Brot. non Linn), *F. spicata* Linn. (*Capnos tenuifolia* Clusius), *F. muralis* Sond., *F. officinalis* Linn. (Portugal); *F. officinalis* Linn. (France).

CORYDALIS Vent.

Erect or procumbent herbs. Leaves pale green, pinnately divided; leaflets deeply lobed, segments usually entire. Flowers in racemes. Outer petals dissimilar ; upper one broad, concave, produced at the base into a hollow spur about half as long as the petal; lower one flat, narrow. Inner petals narrow, clawed, keeled. Lower set of stamens spurred at the base, the spur projecting inside the petal-spur. Capsule ovate-oblong or ovate, 2-valved. Seeds several.—Species 140.—Mediterranean, Europe, Asia.

1. Stems erect. Flowers 2.5 cm. long .... 1. *C. govaniana.*
2. Stems procumbent. Flowers 12 mm. long .... 2. *C. ramosa.*

The genus is tonic, diuretic, and alterative. The roots are used as emmenagogues and vermifuges.

The following species are employed medicinally in Europe—*C. bulbosa* Pers., *C. calviculata* Pers., *C. fabacea* Pers., *C. lutea* DC., *C. ochroleuca* Koch.; in China—*C. ambigua* Cham. & Sch., *C. incisa* Pers.—; in Indo China—*C. bulbosa* Pers.—.

Some twenty alkaloids have been isolated from various Corydalis roots.

1. **Corydalis govaniana** Wall. Tent. Fl. Nap. (1826) 55; Royle Ill. Bot. Himal. t. 16, f. 2; Blatter Beautiful Fl. Kashmir I (1927) 32, pl. 9, f. 3.—PLATE 59A.

Rootstock woody, thick, crowned with withered leaf-sheaths. Stem 0.3-0.6 m., often tufted, erect, as thick as the thumb, almost leafless or with 1-2 leaves near the top. Radical leaves many, nearly as long as the stem, long-stalked, twice pinnate, cut to the base, leaflets wedge-shaped, deeply lobed. Stem-leaves similar, but smaller. Flowers 2.5 cm. long, bright yellow, crowded, arising on stalks from an undivided axis which is 5-10 cm. long. Posterior petal very convex, spur slender, conical, curved. Fruit a capsule, 12-16 mm. long.

Distribution: W. Himalaya from Kashmir to Kumaon, 8,000—12,000 ft.

The root is considered tonic, diuretic, alterative, and antiperiodic. It is prescribed in syphilitic, scrofulous, and cutaneous affections.

Bengal : Bhutkesi, Bhutkis—; *Hindi :* Bhutkesi, Bhutkis—; *Punjab :* Bhutkes, Bhutkis—; *Sanskrit :* Bhutakesi—.

2. **Corydalis ramosa** Wall. Cat. 1434.—PLATE 59B.

Rootstock spindle-shaped. Stem procumbent, 0.3-0.6 m. high, weak, often leafy, branches usually long and straggling. Radical leaves 2-3 times pinnately divided, leaflets deeply lobed, segments small, entire. Flowers 12 mm. long, yellow, arising laxly from an undivided axis which measures up to 12.7 cm. in length. Posterior outer petal hooded, winged on the back, as long or shorter than the

blunt spur. Fruit a capsule, 8 mm. long, stalk bent down. Seeds shining.

Distribution: Temperate Himalaya from Kashmir to Sikkim, 12,000—15,000 ft.

In Kuram the plant is, like all other plants with yellow sap, employed in the treatment of eye diseases (Aitchison; *Flora of the Kurram Valley*).

Kurram Valley : Mamiran—.

FUMARIA Tourn.

Herbs, usually annual, often diffuse or scandent. Leaves multisect ; segments usually narrow. Flowers small, white, rosy, or purplish, in terminal or leaf-opposed racemes. Sepals 2, small. Petals 4, erect or connivent ; the 2 outer dissimilar, the lower flat or concave, the upper gibbous or spurred at the base; the 2 inner clawed, keeled, tips free or coherent. Stamens 6, diadelphous, with a basal spur enclosed in the spur of the petal. Ovary 1-celled ; style filiform ; stigma entire or shortly 2-lobed. Fruit 1-seeded, indehiscent, subglobose.—Species 46.—Europe, Asia, Africa, chiefly Mediterranean.

1. Flowers pink with wings of upper petal reflexed upwards, bracts about as long as the pedicel or longer. Flowers purplish pink with wings of upper petal at most obscurely purple. Fruit of moderate size, subtruncate, rarely apiculate .... 1. *F. indica.*
2. Flowers white, sometimes flushed with pink, with erect spreading, patent or reflexed wings to the broad upper petal; sepals usually present; outer petals not emarginate; the wings of the upper usually with a purple blotch. Fruit often subacute, rugose .... 2. *F. parviflora.*

The genus is tonic, aperient, and resolvent.

The following are used medicinally in Europe: *F. capreolata* Linn., *F. densiflora* DC., *F. media* Lois., *F. officinalis* Linn., *F. parviflora* Lam., *F. schleicheri* Soyer-Willem., *F. spicata* Linn., *F. vaillantii* Lois.—; in Indo China—*F. officinalis* Linn., *F. parviflora* Lam.—.

OFFICIAL :—The flowered plant of *F. capreolata* Linn. var. *α-vulgaris* Machado (*F. capreolata* Vandelli) and varr. *β-bastardi* Machado (*F. officinalis* Brot. non Linn.), *F. spicata* Linn. (*Capnos*

tenuifolia Clusius), *F. muralis* Sond., *F. offiicinalis* Linn. (Portugal); *F. officinalis* Linn. in France.

1. **Fumaria indica** Pugsley in Journ. Linn. Soc. XLIV (1919) 313.—*F. vaillantii* var. *indica* Haussk. in Flora LVI (1873) 443.—*F. parviflora* Wight & Arn. Prodr. Fl. Ind. I (1834) 18 (non Lam.); Wight Ill. I, t. $\frac{114}{80}$.—*F. parviflora* subsp. *Vaillantii* Hook. f. Fl. Brit. Ind. I (1872) 128.

An annual herb, suberect or diffuse, probably scarcely scandent. Leaves multifid, more or less glaucous; leaflets 2-4-pinnatisect; segments long, linear or linear-oblong, flat, acute. Racemes 15-25-flowered, rather dense in flower, in fruit elongate and lax, often almost twice as long as the stout peduncles. Bracts lanceolate-subulate, slightly acuminate; pedicels 2-2.5, rarely 4.5 mm. long, erect-patent, thickened at the apex. Sepals about 1.5 mm. long, 0.5-1 mm. broad, lanceolate or ovate-lanceolate, acuminate, more or less inciso-dentate, rose-coloured, often persistent in the young fruit. Corolla 5-6 mm. long, rose-coloured. Superior petal obtuse, wings rose-coloured, rarely purplish, more or less upwards reflexed, longer than the keel; spur long, curved, not ascending; lower petal with spreading margins, obtuse, spathulate, often free and deflexed; inner petals black-purple at the apex, curved. Fruit about 2.5 mm. broad, subrotund-quadrate, subtruncate and sometimes obscurely retuse, abruptly narrowed below, slightly compressed, but much keeled, especially towards the apex, rugose when dry.

Distribution: Over the greater part of India up to 8,000 ft. on the Himalaya, Baluchistan.—Afghanistan, Persia, Turkestan, Songaria, Mongolia.

The plant is diuretic, diaphoretic, and aperient.

2. **Fumaria parviflora** Lam. Encycl. Méth. II (1788) 567, var. *persica* Pugsley in Journ. Linn. Soc. XLIV (1919) 324.—Plate 58A.

A robust plant, scarcely scandent. Leaves more or less glaucous; segments linear or oblong-linear, rarely broader than 1 mm.; short, subcanaliculate, acute or subacute. Racemes very often sessile, short, in flower dense, in fruit slightly elongate; bracts much longer than the very short pedicels. Sepals absent or minute (about 0.5 mm.

long), triangular-ovate, acuminate, whitish. Corolla very small, about 4 mm. long, white ; upper petal with narrow wings, without purple spot ; inner petals with a purple or greenish tip. Fruit 2 mm. long and slightly broader, subrotund-obovate, very obtuse or subtruncate, obscurely short-apiculate, rugose when dry.

Distribution: Baluchistan.—Taurus, Persia.

The plant is bitter ; cooling, expectorant ; constipating ; increases "vata ;" removes indigestion, biliousness, fever, burning of the body, tired feeling, wandering of the mind, intoxication, urinary discharges, vomiting, thirst ; enriches the blood ; good in leprosy.—. The leaves are bitter, cooling ; constipating ; easily digested ; cure bilious fevers, blood diseases ; allay thirst ; stop wandering of the mind (Ayurveda).

The plant is bitter with a slightly sweetish-sour taste; diuretic, stomachic ; purifies the blood in skin diseases ; strengthens the lungs, the teeth, and gives lustre to the eyes ; stops vomiting ; good in diseases of the spleen (Yunani).

The dried plant is regarded as efficacious in low fever, and is also used as an anthelmintic, diuretic, diaphoretic and aperient, and to purify the blood in skin diseases (Baden-Powell).

Along with black pepper, it is used in the treatment of ague.

It is used in Europe as an alterative, aperient, and antifebrile drug. It is given in Spain in visceral obstructions, in scorbutic affections, and in various eruptive diseases.

Decoctions of the entire plant were given to cases of mild pyrexia and the result was unsatisfactory (Koman).

Arabic : Baglatulmulk, Bukslatulmulik, Shahatraja—; *Bengal :* Bansulpha—; *Bombay :* Pitpatra—; *Deccan :* Pitpapara, Shatra—; *English:* Fine-leaved Fumitory—; *Gujarat:* Khasudlio, Pitpapda, Pittapapado—; *Harboi Hills :* Kafutkawa—; *Hindi :* Pitpapada, Pitpapara, Pitpapra, Shahatra—; *Indo China :* Tuy sha tu chinh—; *Kumaon :* Khairuwa—; *Marathi :* Pitpapda—; *Persian :* Shahatra, Shatra—; *Pushtu :* Papra, Pitpapra, Shahtara—; *Quetta-Pishin :* Shatara—; *Sanskrit :* Araka, Charaka, Kalapanga, Katupatra, Kavachanamaka, Krishnashakha, Ksheparpata, Nakra, Panshu,

Panshuparyaya, Parpata, Parpataka, Pragandha, Pittari, Renu, Shita, Shitavallabha, Sutikta, Tikta, Trishnari, Triyashti, Varatikta, Varmakantaka—; *Sind :* Shahatra, Shatra—; *Tamil :* Tusa—; *Telugu :* Chatarasi—; *Urdu :* Shahatra—.

CRUCIFERAE.

Annual or perennial herbs, rarely somewhat shrubby, with watery juice ; indumentum of simple, medifixed or stellate hairs, rarely glandular. Leaves alternate or rarely opposite; stipules absent. Flowers hermaphrodite, mostly actinomorphic, usually racemose, rarely bracteate. Sepals 4, free, imbricate in 2 series, rarely valvate. Petals 4, rarely 0, mostly equal, often long-clawed, imbricate or contorted ; glands mostly present on the torus, often opposite the sepals. Stamens 6, tetradynamus, very rarely numerous or fewer, free or connate in pairs; anthers 2- (rarely 1-) celled, opening lengthwise. Ovary sessile or rarely stipitate, usually of 2 united carpels, 1-celled with 1-2 parietal placentas and divided by a spurious membranous septum, or sometimes transversely several or many-celled ; stigmas 2 or connate ; ovules usually many. Fruit elongated or short, bivalved or indehiscent, rarely transversely jointed. Seed without endosperm (very rarely a little endosperm present), usually folded ; cotyledons accumbent, incumbent or folded. —Genera 220. Species 1900.—Cosmopolitan, but chiefly N. temperate and especially Mediterranean region.

A. Pods narrow, long. Seeds usually uniseriate (pods sometimes short in Nasturtium).
- I. Sepals narrow, erect; valves without horns or appendages; stigmas erect, connate or decurrent on the style .... MATTHIOLA.
- II. Sepals broad or narrow; stigma undivided or shortly bilobed.
  - a. Sepals erect, lateral saccate.—Hoary, leafy erect herbs CHEIRANTHUS.
  - b. Sepals spreading, not saccate; pods tumid; seeds minute, biseriate. Flowers usually yellow .... NASTURTIUM.
  - c. Sepals not saccate; pods hardly nerved, usually acute; stamens simple. Flowers white or purple .... CARDAMINE.

B. Pods short, broad. Seeds usually biseriate (pods sometimes long and seeds uniseriate in Farsetia).

I. Pods 2-celled; sessile, many-seeded. Seeds compressed, often winged, uniseriate .... FARSETIA.

II. Pods 1-2-celled, 2-many-seeded, valves often tumid. Seeds biseriate (sepals never saccate). Flowers white or yellow.

Sepals, short, spreading. Glabrous herbs .... COCHLEARIA.

C. Pods usually sessile, long, narrow. Seeds usually 1-seriate. Stigma capitate, emarginate or shortly bilobed.

I. Flowers yellow, pedicelled, ebracteate. Pods terete, valves 3-nerved .... SISYMBRIUM.

II. Flowers white. Pods terete, valves 1-3-nerved. Seeds smooth or striate .... ALLIARIA.

III. Flowers yellow, pedicelled, ebracteate. Pods cylindric or flat, valves 1-nerved .... DESCURAINIA.

IV. Flowers white, purple or rose-coloured. Valves of the terete or compressed pod 1-nerved or nerveless .... ARABIDOPSIS.

D. Pods short or long, cotyledons longitudinally folded or deeply grooved.

I. Pods long. Seeds uniseriate .... BRASSICA.

II. Pods short, turgid, beaked. Seeds biseriate .... ERUCA.

E. Cotyledons incumbent, straight, curved or longitudinally folded.

I. Pods many-seeded, valves not winged .... CAPSELLA.

II. Pods few-seeded, valves winged or not .... LEPIDIUM.

F. Pods long or short, transversely jointed; joints indehiscent or the lower 2-valved or reduced to a pedicel for the upper.

Lower joint of pods a seedless pedicel, upper globose 1-seeded .... CRAMBE.

G. Pods long, not jointed, indehiscent, either 1-celled and many-seeded or breaking up into many 1-celled, 1-seeded indehiscent fragments.

Pods long, terete, hollow or septate; seeds globose 2-3-celled .... RAPHANUS.

The members of the Order are acrid, stimulant, and antiscorbutic ; seeds oleaginous, frequently pungent.

The following have been isolated from different parts of the plants:—(1) alkaloids—cheirinine, sinapine—; (2) aromatic alcohols—inositol—; (3) enzymes—myrosin—; (4) glucosides—cheirolin, glucocheirolin,, glucotropeovlin, sinalbin, sinigrin—; (5) acids—behenic, erucic, fumaric, myronic, oleic, stearic—; (6) pigments—quercetin—; (7) mustard oils—allyl, benzyl, phenyl ethyl.

OFFICIAL :—*Brassica spp.* (Germany, Norway); *B. campestris* Linn. (Sweden) ; *B. juncea* (Linne) Cosson (United States) ; *B.*

juncea (L.) Czern.=*Sinapis juncea* Linn. (Russia) ; *B. Napus* Linn. (Denmark, Norway, Sweden) ; *B. nigra* Koch (Austria, France, Great Britain, Holland, Hungary, Italy, Japan, Norway, Sweden, Switzerland)=*Sinapis nigra* Linn. (Spain); *B. nigra* (Linne) Koch (Germany, Turkey, United States)=*Sinapis nigra Linn.* (Russia) ; *B. Rapa* Linn. (Denmark) ; *B. sinapioides* Roth. (Belgium).

Cheiranthus Cheiri Linn. (Portugal).

Cochlearia acaulis Desfont.=*C. Olisiponensis* Brot. or *C. pusilla* Brot. (Portugal) ; *C. Armoracia* Linn. (France, Holland)=*Armoracia rusticana* Gaertn., Meyer, and Scherbius (Portugal) ; *C. officinalis* Linn. (France, Holland, Italy, Portugal).

Erysimum officinale Linn.=*Sisymbrium officinale* Scop. (Portugal).

Lepidium latifolium Linn., *L. sativum* Linn. var. β *crispum* De Cand.=*Nasturtium crispum* J. Bauh. (Portugal).

Nasturtium fontanum Aschers.=*N. officinale* R. Br. (Portugal) ; *N. officinale* R. Br. (France).

Sinapis alba Linn. (France, Switzerland)=*S. foliosa* Willd. (Portugal) ; *S. arvensis* Linn.=*Eruca arvensis* Noulet (Portugal) ; *S. cernua* Thunb. (Japan) ; *S. nigra* Linn.=*Brassica nigra* Koch (Portugal).

Sisymbrium Nasturtium Linn.=*Nasturtium officinale* R. Brown (Portugal).

MATTHIOLA R. Br.

Perennials or annuals, covered with a hoary tomentum or pubescence. Leaves entire, sinuate or toothed. Flowers tolerably large, usually purple, in terminal racemes. Sepals erect ; two lateral inserted slightly lower upon the torus, and convex orsaccate at the base. Petals spreading, usually with a long claw. Stigma sessile with connivent lobes, sometimes thickened or horned at the base. Pod long and narrow, terete or compressed, with a thick pitted septum. Seeds numerous, in one row, flattened and usually narrowly winged ; radicle accumbent.—Species 50.—Mediterranean, Europe, S. Africa, W. Himalaya.

The leaves of the following species were formerly used as emmenagogues in Europe—*M. incana* R. Br., *M. tristis* R. Br., *M. varia* DC.—.

1. **Mathiola incana** R. Br. in Ait. Hort. Kew (1812) 119. —PLATE 60B.

Erect, usually perennial, and more or less woody at the base, but not of long duration; 30-60 cm. high, with hard, slightly spreading branches. Leaves oblong-linear, obtuse, quite entire soft and hoary or both sides, with short crisped hairs. Flowers purple or reddish, rather large, the petals obovate. Pod 8-10 cm. long, crowned by the short stigmas, which are rather thickened at the base

Distribution: Cultivated in Indian gardens. Indigenous in the Mediterranean region and W. Europe.

The seeds are of three kinds—yellow, red, and white—. They are slightly bitter, tonic, diuretic, expectorant, stomachic, aphrodisiac; good in dry bronchitis, fevers, and injuries to the eye (Yunani).

The seeds are used in infusion in cancer ; mixed with wine they are given as an antidote to poisonous bites (Emerson).

They are not an antidote to snake venom (Mhaskar and Caius).

Arabic : Bajarulkumam—; *Catalan :* Viole comu—; *English :* Gilliflower, Hoary Stock, Queen Stock, Stock—; *German:* Winter Levcoje—; *Indo China :* Tu la lan hoa—; *Malta :* Queen's Stock, Stock, Violaciocca, Gizi—; *Persian :* Todri—; *Punjab :* Todri lila, Todri safed—; *Sind :* Todri safed—; *Spanish :* Aleli encanecido—; *Urdu :* Todri safed—.

CHEIRANTHUS Linn.

Hoary herbs, or undershrubs, with appressed bipartite hairs. Leaves oblong-linear, entire or toothed. Flowers large, yellow or purple, racemed. Sepals erect, lateral saccate at the base. Petals clawed. Pod 4-angled, compressed ; valves 1-nerved ; septum membranous ; stigmatic lobes short, spreading. Seeds 1-seriate, flattened, without a border; cotyledons accumbent, very rarely incumbent.—Species 20.—Mediterranean and N. temperate.

C. cheiri Linn. is the only therapeutically active species. Its flowers are officinal in Portugal.

1. **Cheiranthus cheiri** Linn. Sp. Pl. (1753) 924.—PLATE 60A.

A shrub-like herb. Stem smooth, stout, or with a few hairs. Branches numerous, ascending, forked from the base. Leaves entire, lanceolate, acute, with appressed forked hairs. Flowers large, in racemes, generally of a rich orange-yellow, varying from pale yellow to a deep red. Stigma bilobed with reflexed lobes. Pods 4-6 cm. long, not transversely divided, the valves with a slightly prominent midrib.

Distribution: Cultivated in Indian gardens.—Indigenous in the N. temperate zone in Central and N. Europe.

The seeds are tonic, diuretic, expectorant, stomachic, aphrodisiac : good in dry bronchitis, fevers, and injuries to the eye (Yunani).

The flowers, said to be cardiac and emmenagogue, are used in paralysis and impotence. They are boiled in olive oil; and this prepared oil is much used for enemata.

The dried petals are much used in Upper India as an aromatic stimulant (O'Shaughnessy).

The *seed* is also used as an aphrodisiac (Irvine).

An alkaloid, cheirinine, has been isolated from the leaves and seeds. The seeds contain cheiroline, which appears to exist in the plant as a glucoside. Quercetin has been isolated from the colouring matters of the flowers.

Bengal : Khueri—; *Catalan :* Violer groch—; *Dutch :* Muurbloem—; *English :* Banwort, Bee Flower, Bleeding Heart, Blood Wall, Bloody Warrior, Chevisaunce, Churl, Geraflour, Gilli-flower, Heartsease, Jacks, Jeroffleris, Jilliver, July Flower, Keyry, Sweet William, Wallflower—; *French :* Bâton d'or, Carafée, Casse col, Coquardeau, Giroflée, Giroflée jaune, Giroflée des murailles, Giroflée des murs, Giroflée suissard, Murayer, Murer, Rameau d'or, Ravenelle jaune, Violette giroflée, Violier jaune—; *German:* Gelbveiglein, Goldlack, Handblume, Lack, Lackviole, Gelbe Levkoje, Gelbe Viole—; *Hindi:* Lahurishubu, Todrisurkh—; *Italian:* Violaciocca

gialla, Viole gialle—; *Languedoc:* Girouflado fero, Granié—; *Malta:* Wallflower, Violaciocca gialla, Gizi safra—; *Portuguese:* Goivo amarelho, Violeta amarelha—; *Punjab:* Todrisrafarmani, Todrisiyah, Todrisurukh—; *Roumanian:* Micsunea—; *Russian:* Jeltofiol, Levkoi—; *Spanish:* Aleli amarillo—; *Urdu:* Todrisurkha—.

NASTURTIUM Linn.

Terrestrial or aquatic, branched herbs, glabrous or clothed with simple hairs. Leaves entire, lobed or pinnatifid. Flowers small, yellow, rarely white, sometimes bracteate. Sepals short, spreading, equal. Petals short, narrowed at the base, scarcely clawed or 0. Stamens 2, 4, or 6; filaments without wings or teeth. Pods not compressed, subterete; valves faintly 1-nerved; septum hyaline; style short or long and slender; stigma simple or 2-lobed. Seeds small, turgid, usually 2-seriate; cotyledons accumbent.—Species 50. —Cosmopolitan.

1. Aquatic, stem creeping and floating .... 1. *N. fontanum.*
2. Stems weak, suberect, smooth, slightly hairy .... 2. *N. palustre.*
3. Erect, rough-hairy or sometimes glabrous annual .... 3. *N. indicum.*
4. An annual much resembling N. indicum but less robust with larger, smoother, less divided leaves .... 4. *N. montanum.*

The plant is diuretic, stimulant, and antiscorbutic. The seeds are mildly laxative.

The following are used medicinally in Europe—*N. fontanum* Aschers., *N. palustre* DC., *N. sylvestre* R. Br.—; in La Reunion—*N. fontanum* Aschers.—; in Madagascar—*N. barbareaefolium* Baker, *N. fontanum* Aschers.—; in China—*N. montanum* Wall.—; in; Indo China—*N. fontanum* Aschers., *N. indicum* DC,—; In Brazil—*N. fontanum* Aschers.—.

OFFICIAL:—*N. fontanum* Aschers. (=*N. officinale* R. Br.); the whole plant in Portugal; the fresh stems in France.

1. **Nasturtium fontanum** Aschers. in Fl. Prov. Brdbg. (1864) 32.—*Cardamine fontana* Lam. Fl. Fr. II, 499.—*Nasturtium officinale* R. Br. in Ait. Hort. Kew (1812) 110.—PLATE 61B (under *N. officinale* R. Br.).

An aquatic herb; stem 0. 6—1.2 m. long, procumbent and rooting, fistular, often floating. Leaves green or olive-brown, pinnate; leaflets sessile, 3—5 pairs and a terminal one, ovate-oblong or sinuately lobed, obtuse. Flowers small, white, 4—6 mm. diam., in short racemes. Petals exceeding the sepals. Pods 12—25 mm. long, shortly cylindric, stalked, spreading or curved upwards; fruiting pedicels about equalling the siliquas. Seeds minute, muriculate, not winged, red.

Distribution: Baluchistan, Waziristan, Punjab, many hill stations.—Afghanistan, temperate Asia and Europe.

The plant is widely known for its antiscorbutic and stimulant properties. It is used in Brazil in troubles of the chest.

The essential oil consists chiefly of phenylethyl mustard oil, phenylethylisothiocyanate, believed to be derived from a glucoside.

In addition to mustard oil the plant contains a bitter principle, iron, iodine, phosphates, and other salts.

Brazil: Agriao—; *Catalan:* Creixans, Gredas—; *Deccan:* Lutputiah—; *Dutch:* Water-kers—; *English:* Shamrock, Stertion, Water-cress—; *French:* Cailli, Cresson, Cresson aquatique, Cresson d'eau, Cresson de fontaine, Cresson officinal, Cresson de ruisseau, Nasitord, Santé du corps—; *German:* Braunkersch, Brunnenkresse, Kersche,, Quellranke, Wasserraute, Wassersenf, Wiesenkresse—; *Greek:* Sisymbrion—; *Hova:* Anandrano—; *Irish:* Biolar—; *Italian:* Agretto, Crescione, Nasturzio, Sisimbrio, Sisimbro—; *Malta:* Water-cress, Crescione d'acqua, Cresciuni, Sija—; *New uealand:* Kowhiti-whiti—; *North-Western Himalayas:* Piriya-halim—; *Portuguese:* Agriao—; *Provenzal:* Creiso—; *Roumanian:* Brancuta, Cardama de izvor, Hrenita, Nasturel—; *Russian:* Kress—; *Sinhalese:* Kakutupala—; *Spanish:* Berro, Mastuerzo acuatico—; *Swedish:* Kiaelkrasse—.

2. **Nasturtium palustre** DC. Syst. II (1821) 191.—*N. heterophyllum* D. Don Prodr. Fl. Nep. (1825) 202.

A slender, leafy, branched herb with weak or decumbent stems 12—50 cm. long, glabrous or slightly hairy. Leaves variable, usually lyrately pinnatifid, auricled at the base with the lobes toothed

or irregularly lobed, sometimes almost entire, toothed or sinuate-lobed. Flowers small, yellow, in lax racemes. Pedicels slender, ebracteate. Petals about equalling the sepals. Pods oblong, turgid, slightly curved when ripe, 0.63—3 cm. long. Seeds numerous, crowded, in 2 rows.

Distribution: N.-W. India, temperate Himalaya up to 10,000 ft., Assam, Bengal.—Temperate regions of both hemispheres.

The plant possesses the antiscorbutic properties of the genus.

China : T'ing Li.

3. **Nasturtium indicum** DC. Syst. II (1821) 199.—*N. madagascariense* Wight III. t. 13 (non DC.).—*Sinapis divaricata* Roxb. Hort. Beng. (1814) 48.

Erect, 15—45 cm. high, glabrous or hairy ; stem branched from the base, terete, slender. Leaves ovate-lanceolate, runcinate-dentate ; lower leaves 7.5 by 2.5 cm., usually petioled, inciso-pinnatifid or lobed at the base, the lobes acute on both sides irregularly dentate from the middle to the apex ; upper leaves subsessile, denate above the base, subentire at the apex. Racemes terminal, many-flowered, much elongate ; flowers small, yellow ; pedicels 3—6 mm. long. ebracteate. Pods 12—19 mm. long, straight or slightly curved, subterete, spreading or ascending. Seeds numerous minute, ellipsoid, 2-seriate, red, not winged.

Distribution: Throughout India in wet places from Ceylon to Kashmir and Mishmi, Bengal, Assam, Chittagong, Tenasserim, Malay Peninsula, Ceylon.—Malaya, China.

In Indo China the plant is considered diuretic, stimulant, and antiscorbutic. The seeds, which are said to be laxative, are also used in the treatment of asthma.

Indo China: Cai cot xoi, Dinh lich, Lai hoang, Thuy gioi thai—.

4. **Nasturtium montanum** Wall. Cat. n. 4778 (partim).—*Sinapis pusilla* Roxb. Hort. Beng. (1814) 48.

Glabrous or nearly so. Stem erect, grooved, 15—45 cm., branched. Lower leaves stalked, 5—10 cm., pinnatified at least near the base, toothed, gradually passed into the sessile, sinuate-toothed, ovate upper leaves. Racemes long. Flowers yellow. Petals and sepals nearly equal. Pods linear, 2.5—3.8 cm.

Distribution: N.-W. India up to 7,000 ft., Sikkim, Khasia Hills, Burma.—Java, China, Japan.

The plant has antiscorbutic properties.

China: Han Ts'ai.

CARDAMINE (Tourn.) Linn.

Annual or perennial herbs; glabrous or with a few simple scattered hairs. Stems leafy, erect, sometimes weak and half decumbent, usually branched. Leaves stalked, pinnately lobed, radical ones sometimes numerous and spreading; stem-leaves sometimes with 2 long narrow lobes at the base of the stalk. Flowers usually white or tinged with violet, racemed. Sepals equal at the base. Petals clawed. Style usually short, stigma simple or 2-lobed. Pods linear, long, flat, sometimes bursting elastically. Seeds in one row; radicle accumbent.—Species 100.—Cosmopolitan, chiefly temperate.

1. Petals linear, erect, very minute, white, often absent .... 2. *C. impatiens.*
2. Petals spreading, 3 times as long as the sepals .... 1. *C. pratensis.*

The plant is bitter and antiscorbutic. The flowers are diuretic, useful in chorea and asthma.

The following are used medicinally in Europe—*C. alpina* Willd., *C. amara* Linn., *C. asarifolia* Linn., *C. gelida* Schott., *C. hirsuta* Linn., *C. impatiens* Linn., *C. parviflora* Linn., *C. pratensis* Linn., *C. resedifolia* Linn., *C. sylvatica* Link., *C. trifolia* Linn.—; in Indo China—*C. hirsuta* Linn.—; in North America—*C. pratensis* Linn.—.

1. **Cardamine pratensis** Linn. Sp. Pl. (1753) 656.—PLATE 61A.

A perennial glabrous herb. Stem 30 cm. Rootstock sometimes bearing small fleshy tubers. Leaves pinnate; leaflets of the radical leaves orbicular or ovate, terminal longer; those of the cauline leaves linear-oblong, entire, in equidistant pairs, angled, shortly petioled. Flowers large, white or lilac, corymbose when young. Petals spreading, three times as long as sepals. Pods 2.5 cm. linear, erect. Style short.

Distribution: Kashmir.—N. & W. Asia, Europe, Abyssinia, N. America.

The plant is considered to be stimulant, diaphoretic, and diuretic.

In some parts of Europe the plant is used in the treatment of nervous affections. In Cornwall the flowering tops have been employed for the cure of epilepsy throughout several generations with singular success ; though the use of the leaves only for this purpose has caused disappointment.

The seeds contain myronic acid.

Catalan: Creixans de prat—; *Dutch:* Koekoeksbloem, Pinksterbleom—;*English:* Apple-pie, Bird's-eye, Bogspinks, Bonny-Bird-Een, Bread-and-Milk, Canterbury Bells, Cuckoo's Bread, Cuckoo-flower, Cuckoo-pint, Cuckoo's shoes and Stockings, Gilliflower, Gookoo-buttons, Headache, Lady Flock, Lady's Glove, Lady's Smock, Lamb Lakins, Lucy Locket, May Blob, May Flower, Milkgirl, Milk Maids, Paigle, Pigeon's Eye, Pink, Shoes and Stockings, Smell Smock, Spink, Whitsuntide—; *French:* Bec à l'oiseau, Bouquet au coup, Cardamine des prés, Cresson amer, Cresson élégant, Cressonnette, Cresson des prés, Cresson sauvage, Passerage sauvage, Petit cresson aquatique—; *German:* Fleischblume, Gauchblume, Kuckucksschaumkraut, Schaumkraut, Schluesselblume, Wiesenkresse, Wiesenschaumkraut—; *Languedoc:* Creissouneto, Creissoun de prat—;*Spanish:* Mastuerzo pratense—.

2. **Cardamine impatiens** Linn. Sp. Pl. (1753) 655.

Stem erect, smooth, 15—45 cm. high, stiff, branched. Rootstock spindle-shaped. Leaves 7.5—10 cm. long, radical ones few or many, base of the stem-leaves dilated and furnished with 2 long, stem-clasping lobes; segments 7—15, sometimes alternate, those of the radical leaves egg-shaped, bluntly lobed, of the stem-leaves longer lanceolate, entire. Flowers white, 2.5 mm. long, crowded in a panicle. Petals shorter than the sepals, nearly erect. Anthers yellow. Style slender. Pods 19—25 mm., shortly stalked, erect, pointed, with many seeds.

Distribution: Temperate Himalaya from Kashmir to Sikkim, 5,000—12,000 ft.—Afghanistan, temperate Asia and Europe.

The plant is stimulant and diuretic.

English: Mountain Bitter Cress, Narrow-leaved Bitter Cress.

FARSETIA Turra.

Herbs or branched undershrubs, often twiggy, hoary or tomentose. Leaves small, quite entire, alternate. Flowers spicate or racemed, white, pink or yellow, sometimes minute. Sepals usually erect, the lateral ones saccate at the base. Petals clawed. Pods stalked, oblong or linear, much compressed; valves flat or convex, with or without a midrib; septum membranous; veined. Seeds 1—2—seriate, suborbicular, with a broad membranous wing; cotyledons accumbent.—Species about 20.—Mediterranean, W. Asia, N. India, N. Africa.

1. An erect rigid shrub. Flowers large. Seeds biseriate ...... 1. *F. jacquemontii.*
2. Twiggy, covered with denser and finer, closely appressed pubescence. Flowers small. Seeds uniseriate .... 2. *F. hamiltonii.*
3. A rigid hoary undershrub. Flowers large. Seeds usually biseriate .... 3. *F. aegyptiaca.*

Therapeutically the genus is of no importance.

1. **Farsetia jacquemontii** Hook. f. & Th. in Journ. Linn. Soc. V (1861) 148.—PLATE 62B.

An erect, rigid shrub, clothed with appressed hairs attached by the middle; branches terete, slender. Leaves 6—38 by 1.5—2.5 mm., linear-lanceolate; petioles very short. Flowers large, pink, in long slender, lax racemes; buds ellipsoid; pedicels short. Calyx cylindric; sepals 3—6 mm. long, linear-oblong, accute, hairy. Petals 4.5—9 mm. long. Pods stalked, 30—50 mm. long by 3—4 mm. broad, flat, faintly 1-nerved or nerveless; stalks 3—4 mm. long. Seeds 2-seriate, flattened, furnished with a broad membranous wing, brown.

Distribution: Sind, W. Rajputana, N. India.—Afghanistan.

The plant has a pleasant pungent taste and is taken as a cooling medicine after pounding. In the Punjab it is considered specific for rheumatism.

Punjab: Faridbuti, Faridmuli, Lathia, Mulei—.

2. **Farsetia hamiltonii** Royle Ill. Bot. Himal. (1839) 71.—PLATE 62C.

Twiggy; branches numerous, long, slender, covered with dense appressed hairs attached by the middle. Leaves linear, very narrow 6—12 by 0.8 mm. Flowers small, pink, in long spicate racemes. Sepals 2.5—3 mm. long, oblong, obtuse, hairy, the margins scarious. Petals obovate, a little longer than the sepals. Pods 12—19 mm. long by 3—4 mm. broad, flattened; style slender. Seeds brown, 1-seriate, with broad, membranous margins.

Distribution: Sind, Baluchistan, W. Rajputana, Punjab.—Afghanistan, Persia, Arabia, N. Africa.

The plant is pounded and taken as a cooling medicine. It is considered specific for rheumatism in the Punjab.

Punjab: Faridbuti—.

3. **Farsetia aegyptiaca** Turra Farset. I (1765) t. 1.—*F. Edgeworthii* Hook. f. & Th. in Journ. Linn. Soc. V (1861) 147.—PLATE 62A.

Shrubby, 40—50 cm. high, with repeatedly forking, rigid, terete branches, hoary with closely appressed hairs. Leaves linear, hoary. Racemes strict, with subdistant flowers ; pedicles usually from 2 to, at length, 8 mm. Calyx 1 cm.; sepals somewhat connivent above. Pods broadly oblong-elliptical, hoary, ascending, about 1.5 cm. long.

Distribution: Punjab.—Afghanistan, Arabia, Syria, N. Africa.

In the Punjab the plant is considered specific for rheumatism. It is taken as a cooling medicine after pounding.

Punjab: Faridbuti—.

ALLIARIA Scop.

Annual, biennial and sometimes perennating herbs. Hairs simple. Stem erect, mostly branching. Leaves large, simple, petiolate. Sepals erect-patent, outer ones oblong, obtuse, inner ones oblong-ovate, 3-nerved. Petals white, obovate, short-clawed. Stamens 6; filaments linear. Pistil cylindric, sessile; ovary 4—18-ovuled; style short; stigma depressed-capitate, scarcely bilobed. Pods broadly linear, more or less tetragonous, bilocular, septate, bivalved, dehiscing; valves 3-nerved; septum white, membranous foveate. Seeds large, 3—3.5 mm. long, 1-seriate, black; testa longitudinally striate.—Species 2.—Europe, W. Asia to N.-W. Himalaya, N. Africa.

1. **Alliaria officinalis** Andrzej. ap. Marshall-Bieberst. Fl. taur.—cauc. III (1819) 445; Reichb. Deutschl. Fl. I (1837-38) 90, t. 60, fig. 4379.—*Sisymbrium alliaria* Scop. Fl. Carniol. ed. 2, II (1772) 26.

Root biennial, rarely perennating. Stem erect, 0.2—1 m. high, simple or short-branching above, pruinose, hairy below, glabrescent above. Basal leaves long-petiolate (up to 16 cm.), reniform, crenate, stem-leaves larger but with shorter petioles, the lower cordate-ovate, unequally repand-dentate, the upper short-petioled, triangular ovate, the base slightly cordate, unequally and coarsely sinuate-dentate. Racemes corymbiform, 12—30-flowered. Pedicels 4—2.5 mm. long. Flowers scented. Sepals 2.5—3.2 mm. long, glabrous, whitish, greenish at the apex, rarely violet, early deciduous. Petals 4.5—5.5 mm. long. Anthers 0.75—1 mm. long. Pods 8—2.5 mm. long stout pedicels, 1.5—2 mm. diam., patent at almost a right angle, spreading or ascending ; valves 3-nerved. Seeds oblong, striate, dotted.

Distribution: W. Himalaya from Kumaon to Kashmir, 6,000—10,000 ft.—Afghanistan westwards to the Mediterranean, Central and subarctic Europe.

The herb and seeds are esteemed diuretic, diaphoretic, and expectorant, and are used as external application in gangrenous affections, and to promote suppuration.

Dutch: Lookkruid, Look zonder look—; *English:* Beggarman's Oatmeal, Cardiacke, Caspere, Eileber, English Treacle, Garlick-wort, Hedge-garlick, Jack-by-the-hedge, Leek-cress, Garlick Mustard, Penny Hedge, Poor Man's Mustard, Poor Man's Treacle, Sauce Alone, Swarms—; *French:* Herbe aux ailles, Herbe aux ailles, Herbe aux aillets, Herbe aux aulx, Julienne alliaire—; *German:* Knoblauchhederich, Knoblauchkraut, Knoblauchkraut, Knoblauchsrauke—; *Greek:* Skordion—; *IItalian:* Erba alliaria—; *Portuguese:* Alliaria—; *North America:* Hedge Garlic—; *Russian:* Chessnovitsa—; *Spanish:* Aliaria—.

SISYMBRIUM Linn.

Annual or biennial herbs, sometimes suffruticose at the base, erect or rarely subscandent, mostly branching, glabrous or covered

with simple, rarely stipitate-bifurcate or branching hairs. Leaves mostly lyrate-pinnatipartite, rarely runcinate or simple, petiolate, sometimes amplexicaul. Racemes naked, sometimes bracteate. Sepals erect-patent, rarely suberect, the outer ones oblong, obtuse at apex, near apex sometimes distinctly cucullate, the inner ones mostly slightly broader, not or scarcely saccate at the base. Petals yellow, rarely ochroleucous, white, lilac, very rarely purple-violet. Lamina obovate or narrowly spathulate, rotund or subtruncate at the apex, narrowed into a more or less narrow claw. Stamens 6, all erect or the outer ones subascending; filaments slightly broadened at base; anthers oblong, mostly obtuse. Pistil cylindric, sessile; ovary 6—120-ovulate; style short, thickened at apex; stigma depressed-capitate. Pods linear, often very elongate, sometimes attenuate, straight or curved, bilocular, septate, bivalved, dehiscing, valves with a strong median and 2 lateral nerves; style short or almost absent. Seeds 1-seriate, rarely subbiseriate, very rarely biseriate, oblong or ellipsoid, 0.75—2.5 mm. long, sometimes winged at the apex, with filiform funicles. Cotyledons oblong, obtuse, very rarely broadly elliptic, emarginate at the apex, longitudinally conduplicate.—Species 77.—Chiefly in temperate regions of both hemispheres.

A. Fruiting pedicels as broad as the pod .... 2. *S. altissimum.*
B. Fruiting pedicels slender.
  1. Pods 3.8-5 cm., erect .... 1. *S. irio.*
  2. Pods 2.5-3.8 cm., slightly curved .... 3. *S. loeselii.*

The genus is diuretic and expectorant.

The following species are used medicinally in Europe—*S. altissimum* Linn., *S. austriacum* Jacq., *S. Irio* Linn., *S. loeselii* Linn., *S. officinale* Scop., *S. strictissimum* Linn.—.

OFFICIAL:—The leaves of *S. officinale* Scop. (Portugal).

1. **Sisymbrium irio** Linn. Sp. Pl. (1753) 659.—PLATE 63B.

Annual or biennial. Stem 30-90 cm., glabrous or slightly pubescent below. Leaves stalked, runcinate or pinnatifid; lobes not auricled, remote, spreading, toothed; terminal large, sometimes hastate. Flowers minute, yellow; pedicels slender. Pods 3.8-5 cm., overtopping the raceme when young, slender, erect, glabrous,

subtorulose; valves 3-nerved; pedicels ascending, curved. Stigma sessile.

Distribution: Rajputana, Punjab, Peshawar, Baluchistan, Kohat.—Central Asia, Afghanistan, Arabia, Mediterranean, Eritrea.

The seeds have a hot sharp taste; they give mucilage with water; tonic, stimulant, bechic (Yunani).

The seed is expectorant and restorative, and used externally as a stimulating poultice.

It is also said to be febrifuge (Stewart).

In Spain an infusion of the leaves is given in affections of the throat and of the chest.

Arabic: Khubah—; *Catalan:* Apagallums—; *English:* London Rocket—; *Malta:* London Rocket—; *Merwara:* Parjan—; *Persian:* Khakasi—; *Punjab:* Janglisarson, Maktrusa—; *Sind:* Junglisurson—; *Spanish:* Mata candil, Rabanillo amarillo—; *Urdu:* Khubakalan—.

2. **Sisymbrium altissimum** Linn. Sp. Pl. (1753) 659 (excl. synon. plurimis et patr. Ital. et Gall.).—*S. pannonicum* Jacq. Ic. Pl. Rar. I (1781-1786) 12, t. 123; Hook. f. & Anders. in Hook. f. Fl. Brit. Ind. I (1872) 150 (excl. *S. septulatum* DC.).—*S. sinapistrum* Crantz Class. Crucif. (1769) 138.

Root annual or hibernating-biennial. Stem erect, 0.2—0.8 m. high, branching above, flexuose, firm, terete, hispid or glabrate. Basal leaves petiolate, the primary ones minute, oblong-obovate, entire or remotely dentate, the later ones and lower stem-leaves much larger, sublyrate-pinnatisect, oblong-elliptic, 4-7-jugate, middle stem-leaves pinnatisect, 6-7-jugate, uppermost with narrow linear lobes; lower leaves densely, middle ones dispersely hispid and upper ones glabrous. Racemes in flower very elongate, 15-25-flowered. Pedicels 9-4 mm. long. Sepals patent, 4-6 mm. long, glabrous, broadly hyaline-margined. Petals 6-8 mm. long, pale yellow, whitish when fading. Stamens 4-5.5 mm.; anthers narrowly oblong. Nectariferous glands lateral, 5-angular. Pistil stipitiform. Ovary 90-120-ovulate; stigma bilobed, broader than the style. Pod on 10-5 mm. long erecto-patent pedicels, linear, subtetragonous, 5-10 cm. long, 1.2-1.5 cm. diam., straw-coloured or rarely violet; septum fungose. Seeds ellipsoid, compressed, light brown.

Distribution: Kashmir, up to 8,000 ft., Chitral.—Persia, W. Asia, Mediterranean, Central Europe.

The leaves and flowers are considered astringent and antiscorbutic.

3. **Sisymbrium loeselii** Linn. Cent. Pl. I (1755) 18, n. 49; Schlectend. Hall. Fl. Deutschl. XV, 2 (1883) 59, t. 1146.

Root annual or hibernating-biennial. Stem erect, 0.2-1 m. high, mostly branching above, rarely below and rarely simple, densely leafy, hispid with thin, rigid, long (1.2—2.5 mm.), white, shining, more or less retrorse hairs, especially at the base. Basal leaves long-petioled, sublyrate-pinnatipartite, terminal lobe largest, subtriangular-obate; stem-leaves short-petioled, the lower runcinate-pinnatisect, terminal lobe oblong-triangular, unequally denticulate, more or less hastate at base, the upper smaller, terminal lobe narrowly lanceolate; all the leaves more or less strigose-pilose and densely ciliate. Raceme finally very elongate, up to 100-flowered. Pedicels 10-8 mm. long, filiform, erect-patent. Sepals 3-4 mm. long, outer ones broadly oblong, inner scarcely broader, all very spreading, hispid with long hairs, yellowish. Petals 5.5-6 mm. long, yellow, lamina broadly obovate. Outer stamens ascending; anthers narrowly oblong, 1.5 mm. long. Pistil stipitiform; ovary 50-62-ovuled; style very short; stigma large, broader than the style, deeply bilobed. Fruiting pedicels 12-7 mm. long, rectangularly patent, obliquely spreading or ascending. Pods linear, mostly 2-3 cm. long, 0.75 mm. broad, subtorulose, yellowish; valves on both sides obtuse, membranous, 3-nerved; septum ochroleucous, diaphanous, shining. Seeds minute, 1-seriate, ellipsoid, pale brown, shining; radicle slightly longer than the broadly oblong cotyledons.

Distribution: Kashmir, up to 8,000 ft., Peshawar.—Central Asia, Siberia, W. Asia, Central Europe.

The leaves and flowers are given in scurvy and in scrofula.

Descurainia Webb. & Berthel.

Annual or hibernating-biennial, sometimes perennating and suffruticose, erect or ascending, branching, covered with branching short or substellate hairs, rarely mixed with simple hairs, mostly with

glandular hairs. Leaves pinnatisect, lower ones petiolate, upper subsessile. Racemes nearly always chracteate. Flowers mostly minute. Sepals erect-patent or rarely spreading, outer ones narrowly oblong, inner ones slightly broader, not cucullate, not saccate at base, often yellow, sometimes violet, rarely long-persistent. Petals greenish yellow, ochroleucous, yellow, rarely golden yellow, spathulate. Stamens 6, erect, often longer than sepals and petals. Nectariferous glands thinly torose. Pistil cylindrical, sessile; ovary 6-85-ovuled; style very short. Pods abbreviate, at most 4.5 cm. long, bilocular, septate, bivalved; valves with a stout median and very thin lateral nerves; style filiform; septum very hyaline. Seeds 1— or 2-seriate, oblong or ellipsoid, 0.5-1.2 mm. long, sometimes narrowly winged at the apex, with a capillary funicle; testa brown, often black near the hilum. Cotyledons oblong, as long as the radicle. — Species 43. — Most in the cold and temperate regions of the whole of America, some in Asia, Europe and Macaronesia.

D. sophia (Linn) Webb. is used medicinally in Europe and in the United States of America.

1. **Descurainia sophia** (Linn.) Webb ex Prantl in Engl. u. Prantl Pflanzenf. III, 2 (1890) 192. — *Sisymbrium sophia* Linn. Sp. Pl. (1753) 659.—*Sophia chirurgorum* Lobel. Stirp. Hist. Observ. (1576) 426, fig. 1 et Ic. ed. 1 (1581) t. 738, fig. 2.—PLATE 63A (under *Sisymbrium Sophia* L.).

Root annual or hibernating-biennial. Stem erect, 0.2-1 m. high, branching above, rarely simple or branching from the base, densely leafy, covered all over, including the sepals, with branching, substellate, very short pubescence, sometimes mixed below with simple 0.5 mm. long hairs. Basal leaves distinctly petiolate, the primary ones 3-lobed, the following 5-lobed, then more dissected; stem-leaves subsessile, the lower ones obovate 2-or 3-pinnatisect, 6—8-jugate, upper ones smaller, 6-4-jugate. Racemes 50-200-flowered. Pedicels capillary, 8-6 mm. long. All parts of the flower greenish yellow Sepals 2 mm. long, subequal, narrowly oblong, obtuse, erect-patent. Petals mostly shorter than the sepals, spathulate. Stamens longer than sepals and petals. Ovary 24-34-ovuled; style very short. Pods

on pedicels 1.5-6 cm. long and patent at almost a right angle, often subfalcate, rarely recurved, linear, 1.2—3 cm. long, 0.5—0.75 mm. broad, torulose, greenish yellow, sometimes violet; septum with 2, rarely 3, longitudinal nerves. Seeds 1-seriate, oblong-ellipsoid, pale brown.

Distribution: Kashmir to Kumaon up to 14,000 ft., E. Himalaya, Salt Range, Peshawar, Baluchistan.—Afghanistan, Persia, Mesopotamia, Mediterranean, Central, arctic and subarctic Europe, China, Japan, Central Asia. Run wild in S. Africa, N. and S. America, New Zealand.

The seeds are slightly bitter; good tonic and appetiser; improves the voice; useful in chronic bronchitis, inflammation, dysentery; good for pregnant women (Yunani).

The flowers and leaves are astringent and antiscorbutic.

In China and Malaya the drug is regarded as demulcent, laxative, and febrifuge.

In Baluchistan the seeds mixed in syrup are swallowed as a cure for fever (Hughes-Buller).

In the United States of America the herb is used externally in indolent ulcers, and the seeds are given internally in worms, calculous complaints, etc.

The plant was formerly official.

Arabic: Khubah—; *English:* Flixweed, Fluxweed—; *French:* Argentine rouge, Mort aux vers, Moutarde de chien, Rhubarbe des paysans, Sagesse des chirurgiens, Sisymbre sophie, Sophie des chirurgiens, Thalictre des marchands, Thalictron, Thalictron des boutiques—; *German:* Besenkraut, Feinblaetrige, Rauke, Schuttrauke, Sophienkraut, Sophienrauke, Wurmkraut—; *Harboi Hills:* Rush—; *Hindi:* Khubkallana—; *Indo China:* Bo nuong cao—; *Jhalawan:* Rush—; *Kalat:* Rush—; *Malaya:* Tien theng yan, T'ing li yen—; *Persian:* Khakshi—; *Pishin:* Khakshir—; *Quetta:* Khashir—; *Spanish:* Yerba de los cirujanos, Yerba de la sabiduria—; *United States:* Flax weed—; *Urdu:* Khakshir—.

ARABIDOPSIS Heynh.

Annual, biennial or perennating, erect, with branching hairs, often mixed with simple ones, rarely glabrous. Leaves oblong, basal ones petiolate, stem-leaves sessile or sagittate-amplexicaul, entire,

dentate, lyrate-pinnatifid. Racemes sometimes bracteate. Sepals subequal, oblong, not eucullate at apex, inner ones not or scarcely saccate at base. Petals white, lilac, yellow, obovate-cuneate or spathulate, rotund or truncate at apex, rarely absent. Stamens 6, rarely 5 or 4, suberect. Lateral nectariferous glands semiorbicular or ring-shaped, very rarely (in *A. thaliana*) semiglobose and situated in front of the outer stamens. Pistil narrowly cylindric, sessile or shortly stipitate; ovary 20-72-ovuled; style short. Pods on filiform linear, 0.5—5.5 cm. long pedicels; valves 1-nerved; septum mostly white and very hyaline. Seeds 1—, rarely 2-seriate, ovoid, 0.5—0.75 mm. long, brown. Cotyledons broadly oblong, almost as long as the radicle.—Species 11.—Europe, Asia, Africa.

A. thaliana Heynh. is used medicinally in Europe.

1. **Arabidopsis thaliana** (Linn.) Heynh. in Holl. & Heynh. Fl. Sachs. I (1842) 538, n. V.—*Sisymbrium Thalianum* J. Gay & Monard in Ann. Sc. Nat. Bot. 1, sér. VII (1826) 399 in adnot.—*Arabis Thaliana* Linn. Sp. Pl. (1753) 665.

Root annual or hibernating-biennial. Stems 1 or many, erect, up to 45 cm. high, mostly branched, covered at the base with simple hairs, glabrescent above; branches ascending. Basal leaves rosulate, obovate or spathulate, rotund at apex, margin entire or repand, or denticulate, hairs stipitate-branching, mostly forked; stem-leaves smaller, sessile, oblong, mostly entire, covered with forked and simple hairs on both sides and on margin, or subglabrous. Racemes 8-40-flowered. Pedicels 5—1.5 mm. long, capillary. Sepals erect-patent, 1.5—2 mm. long, oblong, obtuse, more or less hispid, rarely glabrous, sometimes violet. Petals white, spathulate, 3-4 mm. long. Stamens 4 or 5 or 6. Lateral nectariferous glands semiglobose. Ovary 48-68-ovuled. Fruiting pedicels 15-4 mm. long, spreading at a right angle or ascending, filiform. Pods linear, subcompressed, 1.2-1.6 cm. long, 0.75 mm. broad, straw-coloured or violet, with a short style; valves thinly 1-nerved; septum very hyaline, white, shinning, nerveless. Seeds minute, 1-seriate, ovoid, pale brown, densely and minutely granular.

Distribution: Kashmir, 5,000-10,000 ft., Kumaon.—Afghanistan, W. Asia, Central Europe, Mediterranean; naturalized in N. & S. America, S. Africa, Australia.

It is used in Spain to cure sores in the mouth.
English: Thale Cress—.

Brassica Linn.

Glabrous or hispid herbs; rootstock often woody. Leaves large, pinnatifid or lyrate, rarely entire. Flowers yellow, in long racemes. Sepals erect or spreading, lateral usually saccate at the base. Pods elongate, terete or angular, often with an indehiscent 1-seeded beak; valves convex, 1-3-nerved, lateral nerves flexuose; style beaked or ensiform; stigma truncate or 2-lobed. Seeds 1-seriate, globose or subcompressed; cotyledons incumbent, concave or conduplicate, the radicle within the longitudinal fold.—Species 33, often polymorphic. Chiefly Mediterranean.

A. Ovary multi-ovulate (9-45). Pods 1.5-10 cm. long. Beak distinctly conical, sometimes as thick as the pod, often 1—or 2-seeded.
- I. Stem-leaves amplexicaul.
  - 1. Flowers not surpassing the buds at flowering.
    - a. Calyx closed. Petals pale yellow, 1.8-2 cm. long. Pods with undulate margins. Leaves more or less fleshy .... 1. *B. oleracea.*
    - b. Calyx half-open. Petals intensely yellow, 0.9-1.8 cm. long. Pods with straight margins. Leaves membranous .... 2. *B. napus.*
  - 2. Flowers surpassing the buds at flowering .... 3. *B. campestris.*
- II. Stem-leaves sessile or petiolate.
  - 1. Leaves with a plane margin .... 4. *B. integrifolia.*
  - 2. Leaves with a crisp margin .... 5. *B. cernua.*

B. Ovary few-ovulate (5-11). Pods 0.8-3. cm. long. Beak very thin, always seedless .... 6. *B. nigru.*

The seeds are stimulant and laxative.

The following species are used medicinally in Europe—*B. campestris* Linn., *B. napus* Linn., *B. nigra* Koch., *B. oleracea* Linn., *B. rapa* Linn.—; in Japan—*B. campestris* Linn.—; in China—*B. campestris* Linn., *B. cernua* Thumb., *B. napus* Linn. var. *chinensis* (Linn.) O. E. Schulz, *B. oleracea* Linn., *B. rapa* Linn—; in Indo China—*B. campestris* Linn., *B. integrifolia* (west.) O. E. Schulz, *B. napus* Linn. var. *chinensis* (Linn.) O. E. Schulz, *B. oleracea* Linn.—; in the philippine Islands—*B. integrifolia* (West.) O. E. Schulz.—.

OFFICIAL:—The leaves and seeds of *B. nigra* Koch (Portugal); the seeds of *B. juncea* (Linne) Cosson and varieties (United States),—(L.) CZERN.=*Sinapis Juncea* Linn. (Russia); *B. nigra* Koch (Austria, France, Holland, Italy, Spain, Turkey),—(L.) Koch=*Sinapis nigra* Linn. (Russia); *B. sinapioides* Roth. (Belgium); the oil from the seeds of *Brassica spp.* (Germany, Norway), *B. campestris* Linn. (Sweden), *B. Juncea* Linn. (Russia, United States), *B. Napus* Linn. (Denmark, Norway, Sweden), *B. nigra* Koch. (Great Britain, Hungary, Japan, Russia, Switzerland), *B. Rapa* Linn. (Denmark).

1. **Brassica oleracea** Linn. Sp. Pl. (1753) 667 (excl. var. x); Freeman Ic. Brit. Plants I (1797), t. 4, 5, n. V; Smith & Sowerby Engl. Bot. IX (1799), t. 637; Schulz in Engl. Pflanzenr. IV, 105 (1919) 27.

Suffruticose, 0.5-1.5 m. high. Stem branching in the upper part, obtusely angular, quite glabrous; branchlets suberect. Basal and lower cauline leaves large, approximate, stalked, lyrate-pinnatipartite, nerves stout, white, prominent especially below, terminal lobe very large, suborbicular or ovate, often obscurely 5-lobed, rounded at the apex, margin crenulate and undulate, at the base obliquely cordate, lateral lobes on each side 3-5, much smaller, obovate, recurved, the upper ones crenulate, the lower ones very small, entire; the middle cauline leaves amplexicaul, oblong-obovate, obtuse, repand-denticulate; the upper leaves oblong-linear, entire or almost so; all fleshy, glabrous, green-glaucous. Racemes 20-40-flowered. Pedicels 6-8 mm. long. Flowers large. Sepals 1-1.1 cm. long, the outer ones narrowly oblong, the inner oblong-ovate, obtuse, erect. Petals pale yellow, 1.8-2 cm. long, blade obovate, rounded at apex, sometimes undulate gradually narrowed into the claw. Inner stamens 13 mm. long, outer 11.5 mm.; anthers 3.8 mm. long, narrowly oblong, slightly acute. Ovary 34-37-ovuled; style 3 mm. long. Fruiting pedicel 1.5-2 cm. long, erect-patent; pods irregularly spreading or ascending, linear, 6-9.5 cm. long, 4-5 mm. diam., compressed-tetragonous, torulose, often serpentine-flexuose, running out into a beak 4-6 mm. rarely 15 mm. long, which is first uniformly tumid and then attenuate, mostly

1-seeded, sessile at the base or with a stalk 2-3 mm. long; valves firm, each with a stout nerve and thinner, lateral, anastomosing veins. Seeds globose, 1.5-2 mm. diam., pendulous, obscurely brown, minutely alveolate.

Distribution: In its varieties cultivated all over India.—The typical plant indigenous in Central Europe.

Leaves bitter, stomachic, cooling, easily digested, cordiotonic; constipating; increase "vata;" good for cough, biliousness, fever, skin diseases, urinary discharges, and piles (Ayurveda).

The Cabbage and its numerous associates are well-known household remedies.

The seeds are diuretic, laxative, stomachic, and anthelmintic. The leaves form a good application in gout and rheumatism.

The red Cabbage is most emollient and pectoral. The juice made into syrup, without any condiments is useful in chronic coughs, and in bronchial asthma. It is considered to be highly antiscorbutic.

The leaves of the common white Cabbage, when gently bruised and applied to a blistered surface, will promote a free discharge, as also when laid next the skin in dropsy of the ankles. Its juice will cure warts.

Bengal: Kopi—; *Catalan:* Col—; *Chinese:* Kan Lan, Pe Ts'ai, Pao Pao Ts'ai—; *Deccan:* Karam—; *Dutch:* Kool—; *English:* Cabbage, Colewort, Collet, Sea Cabbage, Wild Cabbage—; *French:* Chou, Nevette d'hiver, Rabette—; *German:* Gartenkohl, Kohl—; *Greek:* Krambi—; *Gujerat:* Kobia—; *Hindi:* Karamkalla, Kobi—; *Hova:* Laisoa, Laisoamasombika—; *Indo China:* Cam lam—; *Italian:* Cavolo—; *Marathi:* Knolkhol—; *Moldavian:* Curechiu—; *Mundari:* Arakubi, Kubiara—; *Polish:* Iarmuz, Kapusta—; *Portuguese:* Couve, Repolho—; *Roumanian:* Varza—; *Russian:* Kapusta—; *Sanskrit:* Dalamalini, Dalasarini, Kebuka, Kechuka, Keluta, Kembu, Kemuka, Pechuka, Pichuni, Polini, Supatra, Swadukanda, Swalpavitapa—; *Spanish:* Berza, Col—; *Swedish:* Kahl—; *Sze-Chwan:* Lien Hoa Pe—; *Tamil:* Gos, Kos—; *Telugu:* Gos—.

2. **Brassica napus** Linn. Sp. Pl. (1753) 666, n. 3 (sensu ampl.).—*Sinapis dichotoma*, Roxb. ap. Fleming Cat. Ind. Medic. Pl.

in As. Res. XI (1810) n. 3, p. 179; Fl. Ind. III (1832), 117.—*Brassica campestris* Besser Enum. Pl. Volhyn (1822) 72; Hook.f. & Th. Praecurs. ad Fl. Ind. in Journ. Linn. Soc. Bot. V (1861) 169, non Linn.—*B. campestris* Linn. subsp. 1 *campestris* et subsp. 2 *napus* Hook.f. & T. Anders. in Hook.f. Fl. Brit. Ind. I (1872) 156.—*B. campestris* Linn. subsp. *napus* var. *dichotoma* et var. *Toria* Duthie & Fuller Field and Gard. Crops II (1882-1893) 29.—*B. campestris* Linn. subsp. *A. campestris* var. 2. *oleifera* Prain in Agric. Ledger n. 1 (1898) 22, 45, t. IV et *B. napus* Linn. var. *dichotoma* Prain l.c. 36, t. VIII, et subsp. *B. napus* var. 1 *oleifera* var. B. Prain l.c. 46.—PLATE 64A (under *B. campestris* L.).

The whole plant glaucous. Root annual, fusiform, not thicker than the stem. Stem erect, 0.3-1.5 m. high, branching, pruinose, glabrous, below often violaceous; branches erect-patent. Basal leaves distinctly petiolate, lyrate-pinnatisect, terminal lobe the largest, ovate, rotundate at the apex, repand-crenate or-dentate, subtruncate at the base; lateral lobes smaller, ovate, the lowest minute, entire; the lower stem-leaves lyrate-pinnatifid, the upper gradually lanceolate, more or less entire, all dilated and amplexicaul at the base. Raceme at flowering time laxly corymbose, with flowers which don't surpass the flower-buds, later on very elongate, 25-40-flowered. Pedicels 1.2-2 cm. long. Sepals 6-8 mm. long, erect-patent, glabrous, yellowish, the outer ones narrow, obtuse, the inner broadly oblong. Petals yellow, 0.9—1.8 cm. long, lamina obovate, rounded or subemarginate at the apex, narrowed gradually into the claw. Inner stamens 7-10 mm. long, erect, outer ones 5-8.5 mm. long, ascending from the base; anthers oblong, 1.5-3 mm. long. Ovary 20-40-ovuled; style 1.5-2 mm. long. Pods erect-spreading on pedicels 0.8-3 cm. long, linear, curved in the upper part, 5-8.8 cm. long, sometimes shorter, subterete, 2.5-4 mm. diam., torulose with a beak flattened, 0— or 1—, rarely 2-seeded, 0.7-2.4 cm. long, sometimes longer, straw-coloured or purple; valves 1-nerved. Seeds globose, pendulous, 1-1.5 mm. diam., obscurely purple-brown, black near the hilum, minutely reticulate-alveolate.

Distribution: Indigenous in the S. Mediterranean region.—Cultivated elsewhere, also in India.

The root is emollient and diuretic. Its juice is useful in chronic coughs and bronchial catarrh.

Catalan: Nap—; *Danish:* Stekroe—; *Dutch:* Steekraap—; *English:* Coleseed, Navew, Rape—; *French:* Arbi, Chou navet, Navau, Navet—; *German:* Stechruebe—; *Greek:* Bunias—; *Italian:* Napo, Navone—; *Malta:* Navone, Neveau—; *Mundari:* Huringmani, Turimani—; *Polish:* Rzepnica—; *Portuguese:* Nabo—; *Roumanian:* Broajba—; *Russian:* Briukoa, Dikayia Repa, Nyemetskayia Repa—; *Sadani:* Turimani—; *Spanish:* Nabo, Nabo comun, Nabo largo—; *Swedish:* Stickrave—.

2a. **Brassica nepus** Linn. var. **chinensis** (Linn.) O. E. Schulz. —*B. chinensis* Linn. Centur. I. pl. (1755).—*B. oleracea* Linn. var. *chinensis* Prain Note on the Mustards cult. in Bengal in Agric. Ledg. (1898) n. 1, p. 42, t. X et 45.

Like the type, except the following: Lower leaves oblong-obovate in outline, narrowed into a very broad petiole, lyrate-pinnatipartite with the lobes more confluent, with the margins crenate or denate, often undivided, denticulate or subentire, glabrous or setulose and ciliate; often forming a lax, long persistent head; the upper leaves deeply amplexicaul. Petals with a broader claw. Root annual or biennial.

Distribution: Cultivated in India, China, Korea, Japan, Java.

The entire plant is antiscorbutic, arthritic, and resolvent.

The seeds are considered stimulant, stomachic, and laxative.

In Indo China the leaves and stems are considered to be antidysenteric. The seeds are used in gleet and in difficult parturition.

In Chinese drug shops the plant is represented as dry, round light-coloured cakes of vegetable matter made from the broken leaves. The cakes have been found to contain a large amount of various vitamins (Hsien Wu).

Annam: Cai—; *China:* Sung—; *Indo China:* Van dai—; *Japan:* Onuma—; *Malaya:* Pak chai piang—; *Mundari:* Risakubi—.

3. **Brassica campestris** Linn. Sp. Pl. (1753) 666, n. 2; Smith & Sowerby Engl. Bot. XXXII (1811) t. 2234.—*B. campestris* Linn. subsp. *A. campestris* var. 1. *agrestis* Prain in Agric. Ledg. n. 1

(1898) 45.—*Crucifera rapa* E. H. L. Krause in Sturm Fl. Deutschl. 2. ed. VI (1902) 137.— *Brassica colza* Léveillé Monde Pl. XII (1910) 25, n. V.—*B. rapa* Linn. subsp. *rapa* Briquet Prodr. Fl. Corse II, 1 (1918) 74.

Root annual, thin. Stem 50-80 cm. high, rarely reaching 1.5 m., obtusely angular, branching, pruinose, mostly glabrous. Primary basal leaves distinctly stalked, the following ones more or less sessile, rarely distinctly stalked, lyrate-pinnatipartite, about 5-jugate: terminal lobe orbicular of ovate, obtuse at the apex, unequally denticulate, obliquely cordate at the base, lateral lobes alternating, shortly ovate, denticulate, gradually smaller and recurved; lower stem-leaves pinnatifid, but at the base very dilated and amplexicaul, the upper ones panduriform or lanceolate, deeply cordate at the base and amplexicaul, with the margin repand-denticulate or entire. Racemes at the flowering time densely corymbose, with the flowers surpassing the ovoid flower-buds, later on very elongate, about 40-flowered. Pedicels 0.7-1 cm. long, filiform. Sepals 5 mm. long, erect-patent, yellowish green, the outer ones narrowly oblong, sometimes sparingly setulose, obtuse, the inner ones somewhat broader, rotundate. Petals yellow, 7.5 mm. long, limb obovate, subemarginate at the apex, cuneately narrowed at the base. Inner stamens 6.5 mm. long, erect, the outer ones 4.5 mm. long, ascending; anthers 1.8 mm. long. Ovary 20-24-ovuled; style 1 mm. long. Fruiting pedicels 1-3 cm. long, erect-patent or ascending. Pods erect, linear, 3.8-8 cm. long, 2-3 mm. diam., torulose, attenuate into a 0— or 1-seeded, 0.9-2.4 cm. long beak, yellow, with membranous valves. Seeds globose, pendulous, in the beak usually erect, 1.2-1.5 mm. diam., obscurely purplish brown, black near the hilum, reticulate-alveolate.

Distribution: In all probability indigenous in the mountainous region of the Mediterranean.—Naturalized in India.

The seeds yield Oil of Colza. The oil is official in Sweden as OLEUM RAPAE.

Betsileo: Anambe—; *Catalan:* Colinap—; *Danish:* Raps—; *Dutch:* Koolzaad—; *English:* Coleseed, Colza, Field Cabbage, Navette, Swedish Turnip, Wild Navew—; *French:* Chou des champs, Chou

colza, Navette—; *German:* Raps—; *Hova:* Ananomby, Anantsonga, Nave—; *Italian:* Colza—; *Malta:* Summer Rapa, Wild Cabbage, Rapa selvatica, Caulicelli, Liftia—; *New Zealand:* Nani—; *Roumanian:* Rapita—; *Russian:* Colza, Surepitsa—; *Spanish:* Colinabo, Colza, Nabicol, Nabina—.

3a. **Brassica campestris** Linn. var. **rapa** (Linn.) Hartm. Handb. Skand. Fl. 6. ed. (1854) 110.—*B. rapa* Linn. Sp. Pl. (1753) 666, n. 4.

Like the type, but root thickened, fleshy, edible. Plant biennial. Petals often pale yellow.

Distribution: Cultivated throughout India.

Two varieties, red and white; white the better of the two. Oily, bitter, hot and sharp taste; stomachic, cholagogue, vermifuge; destroys "kapha" and "vata;" cures skin eruptions, itching, leucoderma; good in piles, inflammations, ulcers, epilepsy, toothache; stops vomiting (Ayurveda).

The seeds mixed with hot water form an efficient counter-irritant poultice. The oil, combined with camphor, forms an efficacious embrocation in muscular rheumatism, stiff neck, &c.; it is used in dengue fever with benefit, and it is rubbed on the chest in bronchitis.

In Indo China the roots and the leaves are considered stomachic; the ground fresh leaves are applied to abscesses; the seeds are given in colic.

The seeds are not an antidote to snake venom (Mhaskar and Caius).

The oil contains glycerides of erucic acid (Sudborough, Watson, and Ramaswami Ayyar).

Annam: Lu bu, Tron cu—; *Arabic:* Khardaleasvad—; *Bengal:* Kalisarson, Sadarai, Sanshi, Shurshi, Schwetrai, Sursha, Sursi—; *Burma:* Amemniyenzi—; *Canarese:* Kappusasoe, Sarsive—; *Catalan:* Nap de bou, Nap rodo—; *China:* Yun T'ai—; *Cutch:* Surah—; *Deccan:* Kalerayan, Pilerayan—; *English:* Wild Turnip—; *German:* Reps, Ruebe, Ruebsen, Rurnips—; *Gujerat:* Kalarai, Raira,

Sarashire, Sarsawa—; *Hasara:* Dakubi—; *Hindi:* Bangasarson, Baralai, Dain, Dainlai, Jadiya, Jariya, Kalerai, Kalisarson, Khetiya, Lahi, Lahota, Lai, Laita, Pilasarson, Pilirai, Rararada, Rarasarson, Sarson, Sarsonzard, Shetashirsha, Sursi, Tori, Toriya—; *Indo China:* Man thanh, Vu thanh—; *Malayalam:* Karupakatuka—; *Malta:* Swede—; *Marathi:* Kalamohare, Sherasa—; *Mundari:* Dakobi, Piramani—; *Nagpuri:* Dahakobi, Dahakubi—; *New Zealand:* floru —horu, Koran—; *Persian:* Sipandanesiyah—; *Quetta-Pishin:* Jamboi—; *Rajputana:* Sarsu—; *Sanskrit:* Bhutaghana, Bimbata, Duradharsha, Grahagna, Kadamba, Kadambada, Kadambaka, Kalasarshapa, Katukasveha, Katusveha, Rajakshavaka, Rajika, Rakshitaphala, Sarishapa, Sarshapa, Sidhaprayojana, Sidhartha, Tantubha, Tantuka, Tuverika, Ugragandha—; *Sinhalese:* Kaluabbe—; *Spanish:* Nabo gallego, Turnep—; *Tamil:* Karuppukkadugu—; *Telugu:* Nallaavalu—; *Uthal:* Sarih—.

4. **Brassica integrifolia** (West) O. E. Schulz ap. Urb. Symb. Antill. III, 3 (1903) 509.—*Sinapis chinensis* Linn. var. *integrifolia* Stockes Bot. Mat. Med. III (1812) 481. *S. cuneifolia* Roxb. Hort. Beng. (1814) 48, Fl. Ind. III (1832) 121.—*S. nigra* Descourt. Fl. Méd. Ant. VI (1828) 207, t. 430 (non Linn.) —*Brassica juncea* Hook.f. & Th. Praec. Fl. Ind. in Journ. Proc. Linn. Soc. Bot. V (1861) 170; in Hook.f. Fl. Brit. Ind. 1 (1872) 157 et mult. auct. (partim).—*B. juncea* Hook. f. & Th. subsp. *B. rugosa* var. 1 *agrestis* et var. 3 *cuneifolia* Prain in Agr. Ledg. n. 1 (1898) 47, t. II.—PLATE 65 (under B. juncea).

Stem glabrous or with a few bristles at the base, up to 1.5 m. high, often very ramose, often purplish upto the pedicels. Basal leaves long persistent, broadly obovate, cuneately narrowed into the petiole, unequally and more or less coarsely dentate; middle leaves oblong, on each side minutely ca. 8-dentate; upper ones broadly linear, slightly obtuse, narrowed at base, entire; all glabrous, rarely the lower setulose, membranous, glaucescent. Ovary 12—18-ovuled. Pods 3-4 cm. long, 1-2 mm. diam., attenuate into a beak 3-7, rarely 10 mm. long. Seeds 1-1.3 mm. diam.

Distribution: Much cultivated in India.—Indo-Malaya, temperate E. Asia, Africa, Madagascar, West Indies, S. America.

The seeds are warming, sudorific, and a well-known aid to digestion. They are much used in internal congestions, in spasmodic, neuralgic, and rheumatic affections, and in morbid states of the cerebro-spinal system.

In medicine the oil is used as an embrocation and is applied to the skin in eruptions and ulcers.

The oil contains glycerides of erucic acid (Sudborough, Watson, and Ramaswami Ayyar).

Bengal: Raisarisha—; *Bombay:* Rai, Rajika, Sarson—; *Canarese:* Sasive—; *China:* Pai Chieh—; *Cutch:* Rai—; *English:* Indian Mustard, Rai—; *French:* Moutarde de I'Inde, Moutarde rouge—; *Gujerat:* Rai—; *Hindi:* Badshahirai, Barirai, Barlai, Gohnasarson, Khasrai, Rai, Sarson, Sarsonlahi, Shahzadarai—; *Indo China:* Ben, Rau cai, Rau mo, Spey top, Thuy thai—; *Kashmir:* Asur—; *Konkani:* Samsvel—; *Malaya:* Pak kai—; *Marathi:* Mohari, Rayan—; *Mundari:* Rai—; *Philippines:* Mostaza—; *Portuguese:* Mostarde da India, Mostarda vermelha—; *Sanskrit:* Rajika—; *Sinhalese:* Abba—; *Tamil:* Kadugu—.

5. **Brassica cernua** (Thunb.) Forbes & Hemsley in Journ. Linn. Soc. XXIII (1886) 47.—*Sinapis rugosa* Roxb. Hort. Beng. (1814) 48, et Fl. Ind. III (1832) 122.—*Brassica Juncea* Hook. f. & Th. subsp. *B. rugosa* var. *typica* Prain in Agric. Ledg. n. 1 (1898) 47; Duthie Fl. Upp. Gang. Plain (1903) 44.

Lower leaves persistent, very broad, obovate, margin crisp, with ca. 5 obsolete lobes which are densely and acutely dentate; central nerve very stout. Uppermost leaves oblong, subentire or entire; all green. Flowering racemes cernuous. Otherwise like *B. integrifolia.*

Distribution: Seems to be a product of cultivation of the previous species.—India. —China, Japan, West Indies.

The leaves are used in Indo China as an antidysenteric. They are powerfully diaphoretic.

A decoction of the seeds is given in lumbago, cough, and indigestion.

China: Chieh—; *English:* Black Mustard—; *Indo China:* Gioi—.

6. **Brassica nigra** (Linn.) Koch in Rohling's Deutschl. Fl. ed. 3. IV (1833) 713 et Syn. ed. 1 (1835) 59; Boiss. Fl. Or. I (1867) 390; Hook.f. & T. Anders. in Hook.f. F.B.I. I (1872) 156.—*Sinapis nigra* Linn. Sp. Pl. ed. 1. II (1753) 668.—*S. erysimoides* Roxb. Hort. Beng. (1814) 48 (nomen) et Fl. Ind. III (1832) 123 (descript.); DC. Syst. Nat. II (1821) 625.—PLATE 64B.

Root annual. Stem erect, 0.5-1.3 m. high, mostly branching from the middle, more or less hispid, often purple-spotted or purplish in sunny places. Branches thin, divaricate and ascending virgate. Lower leaves distinctly stalked, lyrate-pinnatisect; terminal lobe the largest, ovate, often 5-lobed, on the margin unequally callose-denticulate, at the base more or less hastate; lateral lobes much smaller, obovate or oblong, denticulate, the lowest extremely small; middle leaves shorter-petioled; the upper leaves oblong-linear, narrowed at the base into a short petiole, mostly entire, often pendulous; all very membranous and bright green. Raceme at flowering time corymbose, but the flowers not surpassing the buds, then very elongate, 40-60-flowered. Pedicels very short, 2-3 mm. long, glabrous, Sepals 4-5 mm. long, oblong, erect-patent, glabrous. Petals yellow, 7.5-9 mm. long; blade obovate, at the apex truncate and undulate, cuneately narrowed at the base into a thin claw. Inner stamens 6 mm. long, the outer 5 mm.; anthers oblong, obtuse, 1.5 mm. long. Ovary 7-11-ovuled; style 1-2 mm. long; stigma distinctly broader than the style. Fruiting pedicel 2.5-4.5 mm. long, erect. Pods small, 1-2 cm. long, 1.5-2 mm. diam., linear, subtetragonous, torulose; beak 1.5-2.5 mm. long, thin, seedless; valves 1-nerved with the lateral nerves very thin, straw-coloured, rarely purplish. Seeds globose, 1 mm. diam., obscurely brown, black near the hilum, dilicately alveolate.

Distribution: Cultivated in India and many other countries.—Indigenous in Central Europe, Macaronesian transition area and Mediterranean.

Leaves hot with a sharp pleasant taste; strengthen the body; increase the bile; vermicide; good for throat complaints.—. The seeds have a hot sharp bitter taste; remove "vata;" cure enlargement of the spleen and dispel fever; cause burning; increase the bile; remove cough tumours; anthelmintic; increase appetite; cure skin diseases, itching; destroy external parasites (Ayurveda).

Persian: Sarshaf—; *Polish:* Gorczyka—; *Portuguese:* Mostarda, Mostardeira—; *Potenza:* Lassand—; *Reggio:* Senva—; *Roumanian:* Mustar—; *Russian:* Gortchiza—; *Sanskrit:* Asuri, Atitikshva, Jwalanti, Jwalatprabha, Katuasuri, Krimika, Krishnasarshapa, Krishnika, Kshava, Kshavaka Kshudhabhijanana, Kshujjanika, Kshutabhijanaka, Kshutaka, Madhurika, Raji, Rajika, Raktasarshapa, Raktika, Sarshapa, Tikshnagandha—; *Sinhalese:* Ganaba—; *Spanish:* Mostaza—; *Swedish:* Senap—; *Tamil:* Kadugu—; *Telugu:* Avalu—; *Treviso:* Colzat—; *Urdu:* Rai—; *Verona:* Ravenele—.

ERUCA Adans.

Erect, branched annuals or biennials. Leaves lyrate or pinnatifid. Racemes ebracteate. Sepals erect, nearly equal at the base. Pods oblong-linear, turgid, subterete, with a compressed, seedless, sword-like beak; valves convex with a distinct median nerve; septum membranous; stigma obtuse, undivided. Seeds numerous, biseriate or subbiseriate, with free funicles; embryo with conduplicate cotyledons.—Species 5.—Mediterranean.

E. sativa Gars. is used medicinally in Europe.

1. **Eruca sativa** Gars. Traité pl. anim. II (1767) 166, t. 259; Lam. Fl. Fr. II (1778) 496.—PLATE 66B.

An erect, branched, glabrous, or more or less hispid herb of 60-65 cm. or more. Leaves lyrate-pinnatifid, or obovate to oblanceolate, more or less pinnately toothed or sinuate; upper leaves petiolate, usually toothed. Flowers tolerably large, white or yellow, dark veined. Pods erect, on short pedicels; valves about 2-3 cm. long or less, exceeding or equalling the beak.

Distribution: Cultivated in many parts of India.—Indigenous in the Mediterranean.

The medicinal properties of this plant are the same as those of *Brassica campestris* var. *Rapa* (Ayurveda).

The seeds are vesicant, and the whole plant is considered aphrodisiac.

In Europe the young leaves are used as stimulant, stomachic, diuretic, and antiscorbutic.

The oil from the seeds contains glycerides of erucic acid (Sudborough, Watson, and Ramaswami Ayyar).

Afghanistan: Mandao—; *Bengal:* Shwetsursha, Suffedshorshi—; *Catalan:* Ruca—; *English:* Rocket—; *French:* Roquette, Roquette cultivée, Roquette des jardins—; *German:* Senfkohl—; *Hindi:* Taramira—; *Italian:* Ruchetta, Rucola—; *Kumaon:* Chara, Dua—; *Loralai:* Mulai—; *Malta:* Rocket, Ruchetta, Rucola, Aruca, Eruca—; *North-Western Provinces:* Duan, Lalu, Sahwan, Tara, Taramira, Tira—; *Persian:* Jambeh—; *Punjab:* Assu, Jamnia, Tara, Usan—; *Sanskrit:* Bhutaghna, Bimbata, Daradharsha, Grahagna, Kadamba, Kadambada, Kadambaka, Rajakshavaka, Rajika, Rakshitaphala, Sarishapa, Sarshapa, Sidhaprayojana, Sidharta, Tantubha, Tantuka, Tuverika, Ugragandha—; *Sind:* Jambeho—; *Spanish:* Oruga, Roqueta—.

CAPSELLA Medik.

Annual, branched, often weak herbs, glabrous or hairy. Radical leaves rosulate, entire, lobed or pinnatifid. Flowers racemed, small, white; pedicels slender. Sepals spreading, equal at the base. Petals short. Stamens free, not toothed. Pods obcordate, cuneate, laterally compressed; valves boat-shaped, keeled; septum membranous; style short. Seeds numerous, 2-seriate, ellipsoid; cotyledons incumbent.—Species 4.—Temperate and subtropical regions.

C. Bursa-pastoris Medik. is used medicinally in Europe, Indo China, and North America.

1. **Capsella bursa-pastoris** Medik. Pflanzen. (1792) 85.—PLATE 66A.

An erect herb, 15—60 cm. high, glabrous or hairy; branches terete. Leaves: The radical rosulate, 5—10 (including the petioles if present) by 1.2—2.5 cm. oblong, acute or oblanceolate, toothed or inciso-pinnatifid, the lobes acute on both sides, sometimes entire; stem-leaves distant, 2.5—6.3 cm. long, oblong-lanceolate, amplexicaul, hastate or sagittate at the base with acute parallel or diverging auricles. Flowers at first corymbose, afterwards elongating into a raceme 20—22.5 cm. long. Sepals oblong, obtuse. Petals oblan-

ceolate, white, about half as long again as the sepals. Pods glabrous, 9 mm. long, by 5—6 mm. broad at top; pedicels slender, smooth, terete, ebracteate. Seeds numerous, ellipsoid, reddish brown.

Distribution: Temperate India in cultivated places.—A weed of cultivation.

Plant astringent; seeds stimulant.

Apparently the uses of the plant are unknown in India.

A well-known popular remedy in Europe and North-America. It is of prompt use to arrest bleedings and floodings, when given in the form of a fluid extract; and it may be considered a most reliable medicine for staying fluxes of blood. The fluid extract of the herb is also given for dropsy as a diuretic.

In Tongking the seeds are given in troubles of the chest; the whole herb when fresh is used as an hemostatic.

Extracts of Shepherd's Purse have been used as substitutes for ergot. They have been asserted to contain acetylcholine, choline, and possibly tyramine, as well as fumaric acid and inositol; but, according to Wasicky (*Ber. deutsch. Pharm. Ges.* 1922, 32, 142), plants free from fungoid infection are devoid of active constituents.

Catalan: Bossas de pastor—; *Chinese:* Ch'i—; *Dutch:* Herderstaschje—; *English:* Bad Man's Oatmeal, Blind-weed, Case-weed, Clappede Pouch, Clapper Pouch, Cocowort, Fat Hen, Lady's Purse, Mother's Heart, Naughty Man's Plaything, Pepper-and-Salt, Pick Pocket, Pick Purse, Pick-your-Mother's-heart-out, Poor Man's Parmacetty, Purse, Rattle Pouch, Sanguinary, Shepherd's Bag, Shepherd's Pouch, Shepherd's Purse, Shepherd's Scrip, Tooth-wort, Toywort, Ward-seed, Witches' Pouches—; *French:* Bourse ă berger, Bourse ă curé, Bourse de capucin, Bourse ă Judas, Bourse ā pasteur, Bourserette, Boursette, Capselle, Houlette, Malette, Malette ă berger, Millefleur, Molette, Molette ă berger, Molette des pasteurs, Moufette, Moutarde de Mithridate, Moutarde sauvage, Tabouret, Thlaspi—; *German:* Bauensenf, Beutelschneiderkraut, Blutkraut, Brillenkraut, Daxenkraut, Gaensekresse, Geldbeutel, Grischel, Groeschelkraut, Herzelkraut, Hirtentaeschel, Hirtentaeschlein, Hirtentasche, Klaffer, Klapperkraut, Klepp, Kuespelkraut, Lapatekrokt, Muenselkraut, Nadeldieb, Saeckelkraut, Schaeferkraut, Schedelkraut, Schinken,

Taeschelkraut, Taschenblume, Taschendieb, Taschenkraut, Voegelikraut—; *Harboi Hills:* Chambraka—; *Indo China:* Te, Te thai—; *Italian:* Borsacchina, Borsapastore, Erba raperina, Millefiori—; *Malta:* Shepherd's Purse, Borsacchina, Borsa di pastore, Gargir il gemel—; *Roumanian:* Buruiana de figuri, Buruiana viermelui, Iarba rosie, Pungulita, Tascuta ciobanului, Tascutita, Traista ciobanului—; *Russian:* Pastushiya sumka—; *Spanish:* Bolsa de pastor, Paniquesillo—; *Tongking:* Dinh lich, Dinh luc—.

LEPIDIUM Linn.

Diffuse or erect herbs, undershrubs or shrubs, with entire or divided leaves. Flowers small, white, ebracteate. Sepals short equal at the base. Petals sometimes 2-4 or 0. Stamens 6, 4, or 0. Pods ovate or oblong, rarely globose, usually orbicular, laterally much compressed, tip notched or entire; valves boat-shaped, keeled or winged; septum narrow, membranous. Seeds solitary in each cell; cotyledons incumbent.—Species 100.—Cosmopolitan.

I. Pods orbicular-ovate, notched at tip, valves winged .... 1. *L. sativum.*
II. Pods transversely oblong, tip entire, valves wingless ..... 2. *L. draba.*
III. Pods elliptic or ovoid, tip entire, valves wingless ....
  1. Leaves fleshy .... 3. *L. crassifolium.*
  2. Leaves not fleshy .... 4. *L. latifolium.*
IV. Pods elliptic or oblong, tips retuse or notched, valves keeled, wingless or winged at tip only.
  1. Valves winged at tip .... 5. *L. ruderale.*
  2. Valves almost wingless .... 6. *L. perfoliatum.*

The genus is acrid, antiscorbutic, and sternutatory.

The following are used medicinally in Europe—*L. campestre* R. Br., *L. crassifolium* W. K., *L. Draba* Linn., *L. graminifolium* Linn., *L. iberis* Linn., *L. latifolium* Linn., *L. perfoliatum* Linn., *L. ruderale* Linn., *L. sativum* Linn., *L. virginicum* Linn.—; in West Africa—*L. sativum* Linn.—; in Southern Africa—*L. capensis* Thunb., *L. schinzii* Thel.—; in Brazil—*L. ruderale* Linn.—; in Guiana—*L. virginicum* Linn.—.

OFFICIAL:—Leaves of *L. latifolium* Linn., and *L. sativum* Linn. var. *β-crispum* De Cand. (*Nasturtium crispum* J. Bauh.) in Portugal.

1. **Lepidum sativum** Linn. Sp. Pl. (1753) 644.—PLATE 67.

An erect, glabrous annual. Leaves entire or variously lobed or pinnatisect, often with linear segments; the lower petiolate, the upper linear or linear-oblong, sessile. Pods obovate- or broadly elliptic-rotundate, emarginate (occasionally with 3 valves), slightly but thickly winged above.

Distribution: Cultivated throughout India.—Very likely indigenous in W. Asia.

Hot and bitter; tonic, galactagogue, aphrodisiac; destroys "vata" and "kapha;" cures dysentery; good for pain in abdomen, blood and skin diseases, and tumours. The fresh fruit is good for injuries, skin and eye diseases (Ayurveda).

Seeds hot; leaves hot and dry; diuretic, aperient, bechic, aphrodisiac; good in inflammation and affections of the spleen, in chest complaints, broncitis, rheumatism, and muscular pains; improves brain power and brightens the intellect (Yunani).

According to Honigberger, the plant in the Punjab was administered in cases of asthma, cough with expectoration, and bleeding piles. The root is used in secondary syphilis and tenesmus.

According to Bellew, the seeds are also considered to be galactagogue in the Punjab, and are administered after being boiled with milk, to cause abortion. O'Shaughnessy found the drug to answer as a gentle and warm aperient.

The leaves are mildly stimulant and diuretic, serviceable in scorbutic diseases (Balfour).

Cress seed oil belongs to the Cottonseed oil group.

The plant contains the glucoside glucotropoeolin.

Arabic: Half, Harfulabaz, Hurf, Jarjir, Reschad—; *Bengal:* Aleverie, Halim—; *Bombay:* Ahaliva, Asalia—; *Burma:* Mongnyin, Samungni—; *Canarese:* Allibija, Kurutige—; *Deccan:* Halim—; *English:* Garden Cress—; *French:* Anitor, Cresson alénois, Cresson des jardins, Cresson de terre, Nasitar, Nasitor, Nasitort, Passerage cultivée—; *German:* Gartenkresse, Kresse—; *Gujerati:* Asahio, Halim—; *Hausa:* Labsur, Lausur—; *Hindi:* Chaunsar, Halim, Hurf, Malavan—; *Italian:* Lepidio, Nasturzio—; *Languedoc:* Cercoucello—; *Malta:* Garden cress, Agretto, Crescione inglese, Habberxa—;

Marathi: Ahliva—; *Mundari:* Concur—; *North-Western Provinces:* Halang, Halim—; *Persian:* Rukhame-ispanda—; *Portuguese:* Mastruco—; *Punjab:* Halim, Shargundei, Tezak—; *Sanskrit:* Ashalika, Bhadra, Chandrashura, Chandrika, Charmahantri, Darakrishna, Drighabija, Kalamesha, Karavi, Nandini, Pashumehankarika, Raktabija, Raktaraji, Sidhaprayojana, Suvasura, Vasupreshpa—; *Sind:* Ahreo—; *Spanish:* Mastuerzo hortense—; *Tamil :* Aliverai—; *Telugu:* Adalavitulu, Adeli, Adityalu, Adiyalu—; *Urdu:* Halim—.

2. **Lepidium draba** Linn. Sp. Pl. (1753) 645.

Perennial, 30-50 cm. high or more, pubescent; stem erect, corymbose at the apex. Leaves oblong to oblong-lanceolate, repand or dentate, those of root petiolate, of stem sagittate-clasping. Pods cordate at the base, often with one rudimentary cell; valves turgid.

Distribution: A weed of cultivation in the Punjab.—Persia, Mesopotamia. Caucasus, Europe, Mediterranean.

In Loralai the seeds are used as a cure for flatulency, seven or eight being taken at a time.

In Europe the plant is used as an antiscorbutic.

Afghanistan: Bijindak—; *Catalan:* Capellans, Palitra—; *English:* Hairy Cress—; *Jhalawan:* Garbast—; *Kalat:* Garbust—; *Kila Saifulla:* Buska—; *Kohlu:* Halia—; *Loralai:* Buski—; *Malta:* Hoary Cress, Cocola, Lattona—; *Nushki:* Garbast—; *Pishin:* Bushka—; *Quetta:* Bushka, Busk—; *Spanish:* Lepidio drava—; *Tasmania:* Hoary Cress, White Weed—; *Zhob:* Bushka, Buska—.

3. **Lepidium crassifolium** W. K. Pl. Rar. Hung. I, 4, t. 4.

A perennial herb, glabrous or puberulous. Stem divaricately paniculate-corymbose. Leaves fleshy; radical ones petiolate, ovate, entire or few-dentate, stem-leaves gradually smaller, lanceolate, sagittate. Pods ovate or elliptic, reticulate, entire at the apex, valves without wings; stigma subsessile. Cotyledons entire.

Distribution: Baluchistan.—Oriental region, Europe.

The plant is employed as a rubefacient in rheumatism. The seeds are prescribed internally in rheumatism and dropsy.

4. **Lepidium latifolium** Linn. Sp. Pl. (1753) 644.

Perennial, 10 cm. high or more, glabrous or puberulent, paniculate above. Leaves oblong-lanceolate, entire or dentate, the lower ones long-petioled, 15 cm. long, the upper ones short-petioled or merely tapering at the sessile base. Pods ovate-orbicular or elliptical, 1-15 mm. long, sometimes retuse at the base, glabrous or puberulent; stigma sessile.

Distribution: Kashmir.—N. and W. Asia, Europe, N. Africa.

The plant is depurative and antiscorbutic. It is used as a resolvent in skin diseases.

Catalan: Herba de la fluxio, Morritort bort, Morritort salvatge—; *English:* Dittander—; *Italian:* Mostardina, Pepealla—; *Ladak:* Gonyuch—; *Portuguese:* Herva pimenteira, Herva serra, Lepidio—; *Spanish:* Lepidio, Mastuerzo mayor—.

5. **Lepidium ruderale** Linn. Sp. Pl. (1753) 645.

Annual, erect or diffuse, glabrous or pubescent. Radical leaves much divided, segments narrow; lower leaves 2-pinnatifid, upper linear, entire. Flowers minute in terminal and lateral corymbs, apetalous, diandrous. Pod orbicular-oblong, flat, up to 2 mm. long, valves winged at the tip; pedicels slender, diverging. Seeds compressed.

Distribution: Kashmir, 7,000—13,000 ft.—Oriental regions to Europe, Australia.

The plant is used in impetigo.

Brazil: Mastruco, Menstruco—; *English:* Narrow-leaved Pepperwort—; *Tasmania:* Narrow-leaved Cress—.

6. **Lepidium perfoliatum** Linn. Sp. Pl. (1753) 643.

A biennial herb. Stems erect, paniculate-corymbose. Lower leaves pinnatisect, segments multifid, upper deeply cordate-amplexicaul, entire. Flower ochroleucous. Fruiting racemes elongate. Pods orbicular-elliptic, retuse at the apex, valves keeled, almost wingless. Style very short.

Distribution: Baluchistan.—Afghanistan, through the Oriental region to S. Europe.

In Europe this plant is popularly believed to be a useful antiscorbutic.

COCHLEARIA Tourn. ex Linn.

Glabrous, often fleshy, annual or perennial herbs. Leaves pinnatifid or toothed, rarely entire. Flowers yellow, lilac or white, in racemes, rarely solitary. Sepals spreading, equal at the base. Petals entire, shortly clawed. Filaments without appendages or teeth. Pods globose ovoid or oblong, valves turgid. Seeds usually 2-seriate, compressed, without wings; cotyledons accumbent.—Species 20.—Europe, Asia.

Acrid, bitter, antiscorbutic herbs.

The following species are used medicinally in Europe—*C. armoracia* Linn., *C. officinalis* Linn.—; in Brazil—*C. armoracia* Linn.—.

OFFICIAL:—*C. acaulis* Desfont.=*C. Olisiponensis* Brot. or *C. pusilla* Brot. (Portugal); the fresh root of *C. armoracia* Linn. (France, Holland)=*Armoracia rusticana* Gaertn., Meyer, and Scherbius (Portugal); the fresh stem of *C. officinalis* Linn. (France, Holland, Italy, Portugal).

1. **Cochlearia flava** Ham. ex. Roxb. Hort. Beng. (1814) 48.

An erect, rarely depressed, diffusely branched glabrous annual, about 0.3 m. high. Root long, fusiform. Leaves 10-12.5 cm., lanceolate, pinnatifid; lower stalked; upper smaller and auricled; lobes sinuate-toothed. Racemes numerous. Flowers small, yellow. Pods globose, smooth; valves without nerves. Style short, thick. Seeds many, rugose, with filiform funicles.

Distribution: Gangetic valleys from the Punjab to Bengal.

The plant is used against fever in Bihar (Haines).

CRAMBE Tourn ex Linn.

Stout herbs or undershrubs, glabrous or pilose. Leaves pinnate lyrate or toothed. Racemes elongate, ebracteate, usually panicled. Flowers conspicuous, white. Sepals spreading, equal at the base; filaments of the longer stamens frequently toothed at the top. Pods indehiscent, articulate, the upper joint globose, 1-celled, 1-seeded; lower seedless forming a pedicel to the upper joint. Seed globose,

pendulous from the incurved tip of the funicle, which rises from the base of the cell; cotyledons conduplicate.—Species 20.—Europe, Mediterranean, Asia, Polynesia, Patagonia.

In Europe *C. hispanica* Linn. and *C. maritima* Linn. are considered specifics against scrofula.

1. **Crambe cordifolia** Stev. in Mém. Soc. Nat. Mosy. III (1812) 267.—*C Kotschyana* Boiss. Diagn. sér. 1, VI, 19.

A tall stout bristly hairy perennial. Stem striated. Rootstock thick. Radical leaves on stout petioles, 2.5-5 cm., petiole striated and dilated at the base, rounded and cordate, laciniate and variously toothed; cauline on shorter petioles, ovate-elliptic or rhomboid, toothed or lobed. Racemes loosely panicled. Pods globose, upper part pisiform, crustaceous.

Distribution: Kashmir, Baluchistan.—Afghanistan, Persia, Caucasus.

At Hindubagh the plant is used as a cure for itch (Hughes-Buller).

Harnai: Nawarra—; *Hindubagh:* Pashai, Skharyae, Skhrai—; *Khwas:* Naghour—; *Kila Saifulla:* Pursail—; *Nushki:* Pilgosh—.

RAPHANUS Linn.

Coarse, rough or glabrous annuals or biennials. Leaves lyrate-pinnate or pinnatifid. Flowers large, yellow, white or pale lilac, veined with purple, in long ebracteate racemes. Sepals erect, lateral ones saccate at the base. Pods indehiscent, elongate, terete, thick, continuous or constricted, with a long tapering pointed beak, continuous within or filled with pith separating the seeds. Seeds pendulous, globose; cotyledons conduplicate.—Species 8.—Chiefly Mediterranean.

R. sativus Linn. is used medicinally in Europe, China, Indo China, Malaya, and the Malay Archipelago.

1. **Raphanus sativus** Linn. Sp. Pl. (1753) 669 (*J. chinensis annuus oleifer*) ed. 2, II (1763) 935; Schulz in Englar's Pflanzenr. IV, 105 (1919) 205—PLATE 68.

Root annual. Stem 0.2-1 m. high, flexuose, fistular, branched in the upper part, glabrous or hispid, often purple. Lower leaves

on hairy petioles 5.5-3 cm. long, lyrate-pinnatifid, 3-4-, rarely 5- jugate; terminal lobe suborbicular or shortly ovate, rounded at the apex, with the margin repand-crenate, subcordate at the base or more or less confluent with the lateral lobes; lateral lobes alternate, oblong-ovate, obtuse, dentate or subentire; upper leaves shorter petiolate, 2-1-jugate, terminal lobe oblong-ovate, margin coarsely dentate; uppermost leaves simple, sublinear, but narrowed at the base; all roughly pilose, bright green, often obscurely red-margined, often also red-nerved. Raceme lax, 8-30-, rarely up to 55- flowered. Pedicels 2-1 cm. long, with scattered hairs. Flowers scented. Sepals 6.5-10 mm. long, oblong, sometimes brown-red. Petals 1.7-2.2 cm. long; blade obovate, subemarginate at the apex, white or lilac with yellow or purple veins. Ovary green or brown-purple, 10-12-ovuled; style about 4 mm. long. Fruiting pedicel 2.2-1 cm., rarely up to 3.5 cm. long, erect-patent, or ascending. Pods erect, cylindric, 3-9 cm. long, 0.8-1.4 cm. diam., continuous or more or less constricted, longitudinally sulcate-nervose, yellow, rarely quite pale purple, beak green. Seeds sessile, pendulous, ovoid, light brown, testa reticulate.

Distribution: Cultivated all over India up to 16,000 ft.—In temperate and warm countries.

The radish has a hot, sharp, bitter taste; stomachic, binding, anthelmintic; destroys "vata;" good in tumours, piles, and all inflammations; useful in diseases of the heart, amenorrhea, hiccough, leprosy, cholera; the juice relieves earache.—. The flowers are bechic and cholagogue (Ayurveda).

The root is useful for urinary complaints and piles.—. The seeds are sharp and bitter; laxative, tonic, emmenagogue, carminative; good for the spleen and in paralysis; produce alopecia; mixed with wine they counteract the effects of the bites of snakes and other poisonous animals (Yunani).

Radish seeds are peptic, expectorant, diuretic, laxative, carminative, and corrective. In the Punjab they are considered to be emmenagogue (Stewart).

The roots are used for urinary and syphilitic diseases; they are a reputed medicine for piles and gastrodynic pains.

The juice of the fresh leaves is also used as a diuretic and laxative.

The seeds are not an antidote to snake venom (Mhaskar and Caius).

Arabic: Bajrulkijal, Bokel, Fidgel, Fioyl, Fugel—; *Bengal:* Mula—; *Bombay:* Mula, Muro—; *Burma:* Monelahmungla, Moula—; *Canarese:* Bili, Mullangi, Mullangiyanne—; *Catalan:* Raha—; *Chinese:* Lai Fu, Tsai Fu Ken—; *Danish:* Redike—; *Deccan:* Mulli—; *Dutch:* Radijs—; *Egypt:* Fidjel—; *English:* Garden Radish, Radish—; *French:* Navet rave, Radis, Petit radis, Radis rond, Radis rose, Petite rave, Rave rose, Tendrette—; *German:* Gartenrettich, Rettich, Retting, Sommerrettich, Winterrettich—; *Greek:* Raphanis—; *Gujarat:* Mala, Mura—; *Hindi:* Muli, Muro—; *Hova:* Radisa—; *Hungarian:* Retek—. *Indo China:* Cu cai, Lai bac, Lo bac, Lu bu—; *Italian:* Rafano, Ramolaccio, Ravanello, Ravano—; *Konkani:* Mullo—; *Languedoc:* Rabasso, Rafé—; *Malaya:* Lobak, Loh fook—; *Malayalm:* Mullangi—; *Malta:* Radish, Radice, Rafano, Figel, Ravanall—; *Marathi:* Mula, Muri—; *Mongolia:* Laopang, Lobin, Turma—; *Mundari:* Morai, Moroe, Murai, Muroe—; *Mysore:* Magunigadde—; *Nepal:* Mulasinki—; *North-Western Provinces:* Muli—; *Persian:* Tukhmeturub, Turup—; *Philippines:* Rabano—; *Portuguese* Rabanete, Rabano, Rabao, Rabao negro—; *Punjab:* Muli, Mungra, Taramira—; *Roumanian:* Ridiche—; *Russian:* Radis, Rediska—; *Sanskrit:* Bhumikakshara, Dirghakandaka, Dirghamulaka, Dirghapatraka, Hariparna, Hastidanta, Hastidantaka, Kandamula, Karukandaka, Ksharamula, Kunjar, Kahakanda, Mritakshara, Mulaka, Mulavha, Nilakantha, Rajaluka, Ruchira, Ruchishya, Shankhamula, Shimbiphala, Sita—; *Sind:* Muri—; *Sinhalese:* Rabu—; *Spanish:* Rabano—; *Swedish:* Raettika—; *Tamil:* Mullangi, Mulinghie—; *Telugu:* Mullangi—; *Tibet:* La phug—; *Urdu:* Mulekebija—.

CAPPARIDACEAE.

Herbs or shrubs, erect or climbing, rarely trees. Leaves alternate or rarely opposite, simple or palmately 3-9-foliolate; leaflets usually entire; with or without stipules. Flowers regular or slightly irregular, bisexual or rarely dioecious. Sepals generally 4, free or connate. Petals usually 4, imbricate, hypogynous or sometimes inserted on the disk. Stamens usually 6, sometimes 4 or numerous. Ovary usually stalked, 1-celled; ovules many. Fruit a pod-like capsule or a berry or rarely a drupe. — Genera 40. Species 450. — Tropical and warm temperate regions.

A. Herbs. Fruit capsular.
- I. Stamens sessile on the disk. Petals imbricate in bud ...... CLEOME.
- II. Stamens on the gynophore. Petals open in bud .... GYNANDROPSIS.

B. Shrubs or trees. Fruit berried or capsular.
- I. Calyx-tube lined by the disk, lobes valvate. Petals 4. Fruit moniliform .... MAERUA.
- II. Sepals 4, open in bud, disk hemispheric .... CRATAEVA.
- III. Sepals 4, biseriate, imbricate or 2 outer valvate.
  - a. Stamens 4-6, inserted high on the gynophore .... CADABA.
  - b. Stamens 8-∞ inserted at the base of the gynophore .... CAPPARIS.

The herbaceous members are acrid and their therapeutic properties are similar to those of the Crucifers. These same properties persist in the roots and the leaves of the arboraceous members, the bark of which is usually bitter and laxative.

Quercetin has been isolated from the flowers of *Capparis spinosa* Linn.

CLEOME Linn.

Herbs. Leaves simple or 3-9-foliolate, entire or serrulate. Flowers solitary or racemose, white, yellow, pink or purple. Sepals 4, spreading. Petals 4, subequal, sometimes subunilateral. Stamens 4-8, inserted on the torus. Ovary sessile or with a very short gynophore; ovules many, on 2 parietal placentas; style short or 0. Capsule usually elongate, sometimes inflated, sessile or stalked, 1-celled, 2-valved; valves membranous, separating from the persistent

placentas. Seeds reniform.—Species 70.—Tropical and subtropical regions.

A. Leaves simple.
Stamens 6 or less.
Leaves oblong-lanceolate, penni-nerved; bracts petiolate ... 1. *C. monophylla.*
B. Leaves compound.
I. Stamens 6. Capsules sessile or subsessile.
Leaflets linear-oblong to obovate.
Stem and leaves not asperous .... 2. *C. brachycarpa.*
II. Stamens indefinite.
a. Flowers yellow. Capsule glandular pubescent ...... 3. *C. viscosa.*
b. Flowers purple or pink. Capsule glabrous, striate .... 4. *C. felina.*
c. Flowers rosy. Capsule smooth .... 6. *C. chelidonii.*
d. Leaves 7-foliolate .... 5. *C. heptaphylla.*

The leaves are stimulant; the roots stimulant, antiscorbutic, and anthelmintic; the seeds rubefacient, vesicant, anthelmintic, and carminative.

The following are used medicinally:—in Indo China—*C. chelidonii* Linn., *C. viscosa* Linn.—; in the Philippine Islands—*C. viscosa* Linn.—; in North and Central America—*C. gigantea* Linn., *C. heptaphylla* Linn., *C. serrata* Jacq., *C. viscosa* Linn.—; in the Gold Coast—*C. ciliata* Schum. & Thonn.—; in La Reunion—*C. viscosa* Linn.—; in Guiana—*C. frutescens* Aubl.—.

1. **Cleome monophylla** Linn. Sp. Pl. (1753) 672.

Erect, branched 30-60 cm. high, more or less hairy or pubescent; stems striate. Leaves simple, 2.5-7.5 by 1.8-2.2 cm., passing gradually into bracts above, oblong-lanceolate, base truncate, rounded or cordate; petioles slender, 2.5-3.8 cm. long. Flowers pink, solitary in the axils of stalked, leafy bracts, in a long erect raceme; pedicels slender; bracts ovate or subdeltoid, cordate, strongly pubescent. Stamens 6. Sepals linear, acute, ciliate with gland-tipped hairs. Petals oblong, rounded at top, clawed. Capsules 6.3-9 cm. by 2-3 mm., subcylindric, pointed, striate, clothed with short stout hairs. Gynophore very short or 0. Seeds transversely rugose.

Distribution: From Bihar and Orissa to Gujarat, the Deccan, the Konkan, S. Maratha Country and Ceylon, in fields and waste places.—Tropical Africa.

The pounded root is put on the lips by the Santals to restore conciousness when in a faint (Campbell).

Kolami: Chamani—; *Mundari:* Carmani ara, Carmari ara—; *Sadani:* Hurhuriasag—; *Santali:* Hurhura, Kedar jhawar—.

2. **Cleome brachycarpa** Vahl. (ined.) ex DC. Prodr. I. (1824) 240.

A perennial herb, 15-45 cm. high, with an odour of rue; stems many from a woody base, the older subglabrous, the younger glandular or viscid-pubescent. Leaves 3-5-foliolate; petioles 3-6 mm. long; leaflets 6-9 by 2.5-6 mm., obovate-oblong, viscidly puberulous; petiolules very short. Flowers yellow, in the axils of leafy bracts, in lax racemes; pedicels 9-13 mm. long, filiform; bracts 3-foliolate or simple, subsessile. Sepals 2.5 mm. long, ovate-lanceolate, much shorter than the petals, glandular-pubescent outside. Petals 6-9 mm. long, ovate-oblong, subacute, glabrous, furnished inside with a small scale-like appendage above the short claw. Stamens 6. Capsule 9-12 by 2.5-4 mm. oblong, inflated, glandular; style about 6 mm. long, filiform. Gynophore 0. Seeds minute, smooth.

Distribution: Sind, Baluchistan, W. Rajputana Desert, Punjab Plain.—Westward to Arabia, Abyssinia and N. Africa.

The plant is very bitter; good for scabies, rheumatism, and inflammations. Leaves beneficial in leucoderma (Yunani).

In Ormara the plant is considered as a useful medicine for persons suffering from heat (Hughes-Buller).

Jhalawan: Ponwar—; *Ormara:* Shapako, Shawang—; *Sind:* Kasturi—; *Urdu:* Panwar—.

3. **Cleome viscosa** Linn. Sp. Pl. (1753) 672; Wight Ic. t. 2. —*Polanisia viscosa* DC. Prodr. I, 242.—Plate 69.

Annual, erect, 30-90 cm. high; stems grooved, densely clothed with glandular and simple hairs. Leaves 3-5-foliolate; petioles of the lower leaves 2.5-5 cm. long, gradually becoming shorter upwards; the bracts often subsessile. Leaflets elliptic-oblong or obovate, acute or obtuse, the terminal the largest and reaching 4.3 by 2.5 cm. (when 5-foliolate the basal pair much reduced); petiolules short,

hairy. Flowers yellow, axillary, growing out into a lax raceme; pedicels slender, terete, hairy. Sepals 4.5 mm. long, oblong-lanceolate, glandular-pubescent outside. Petals oblong-obovate, about 12 mm. long, veined. Stamens exceeding 20. Capsules 5-6.3 by 0.4 cm., erect, hairy, obliquely striate, compressed, tapering towards both ends, terminated by a style 3 mm. long. Seeds brown-black when ripe, finely transversely striate, subglobose.

Distribution: Throughout the tropics of the world.

The plant has a saltish bitter taste and a strong odour; cooling, stomachic, laxative, diuretic, anthelmintic; removes "kapha;" causes excessive biliousness, dryness, and urethral discharges; reduces tumours and inflammations; useful in skin diseases, itching, ulcers, leprosy; good in malarial fevers and fevers due to indigestion; enriches the blood and is useful in blood diseases and uterine complaints; cures cough and earache (Ayurveda).

The plant has a penetrating bad smell. The leaves favour digestion and dispel intestinal fermentation; the juice cures earache; good in malaria; useful in piles and lumbago as a local stimulant. The seeds are anthelmintic and detergent (Yunani).

The juice of the leaves is poured into the ear to relieve earache, and the bruised leaves are applied to the skin as a counterirritant.

The seeds are used as anthelmintic and carminative; they also are given occasionally in fevers and diarrhœa.

In Indo China the roots are considered to be stimulant and antiscorbutic; the whole plant, bruised, is used for counterirritation and blistering.

In La Reunion the plant is said to be astringent and antispasmodic.

The leaves are given by the aboriginals of Australia to relieve headache.

In the United States, the roots are said to be used as a vermifuge.

In Ceylon the roots and the seeds are considered to be cardiac stimulants, and they are given internally in cases of snake bite (Roberts).

The roots and seeds are useless in the antidotal and symptomatic treatment of snake bite (Mhaskar and Caius).

"The seeds of this plant are said to possess anthelmintic and rubefacient properties. Mohideen Sheriff recommends the pure dried seeds as substitute for santonin. The dose recommended is half to one drachm for adults and half the quantity to children to be given twice a day for two days and followed on the third day by a dose of castor oil. I tried the drug as per directions given above in an adult and in a child whose motions contained large number of round-worm ova, but the result was negative in both the patients" (Koman).

Arabic: Bantakalan—; *Bengal:* Hurhuria—; *Biru:* Cirlinggid—; *Bombay:* Hurhuria, Kanphuti, Pivalatilavana—; *Canarese:* Nayi-bela—; *Deccan:* Choriajuwan, Churaiyajwani, Janglihulvul—; *Gangpur:* Cirliggid—; *Gujerat:* Talvani, Tilwan, Tinmani—; *Hausa:* Namijan gasaya—; *Hindi:* Hulhul,, Hurhur, Hurhureh, Jangliharrar, Kanphytia—; *Indo China:* Man man trang, Sa phac ron tien—; *Malay:* Kutepeng—; *Malayalam:* Ariavila, Katkudagu—; *Marathi:* Harhuria, Kanphodi—; *Mundari:* Marang carmaniara—; *Porebunder:* Pilitalvani—; *Punjab:* Bugra, Hulhul—; *Sanskrit:* Adityabhakta, Arkabhakta, Arkakanta, Arikahita, Barbara, Bhaskareshta, Brahma-suvarchala, Karnasphota, Kukavaiminta, Kukavumitie, Mandukaparni, Manduki, Martandavallabha, Raviprita, Ravishta, Sauri, Satyanamni, Shunakabarbara, Surasambhava, Suryalata, Suryavarta, Suvarchala, Suteja, Svanabarbara, Tilparni, Varada, Vikranta—; *Sind:* Kattori—; *Sinhalese:* Ranmanissa, Walaba—; *Tagalog:* Apoyapoyan, Balaba-lanoyan, Silisian, Silisilihan—; *Tamil:* Nayikkadugu, Nayivelai—; *Telugu:* Kukhavavulu, Kukhavominta—; *Urdu:* Hulhul—; *Visayan:* Hulayassangayan—.

4. **Cleome felina** Linn. f. Suppl. 300.—*Polanisia felina* DC. Prodr. I, 242.

An annual erect herb, 30—60 cm. high, much-branched; stem and leaves entirely clothed with stiff appressed scale-like hairs. Leaves 3-foliolate; leaflets 10—25 mm. long, obovate, obtuse, equalling or shorter than the petioles. Flowers axilliary, solitary on long pedicels, 12—18 mm. long, purple or pink. Calyx and corolla

bristly outside. Stamens about 30; filiform. Capsule 8 times as long as broad, compressed, linear-oblong, acute at both ends, striate, glabrous. Seeds large, glabrous, tubercled.

Distribution: S. Maratha Country; N. Circars and Deccan districts of Madras Presidency.

The plant is reputed antiscorbutic.

The seeds are vesicant; they are given internally as a vermifuge.

The plant mixed with milk is applied externally to raise blisters.

Malayalam: Ariavila.

5. **Cleome heptaphylla** Linn. Sp. Pl. 987.

A herb, aculeate, hirsute-viscous. Leaves 7-foliolate. Floral leaves simple, cordate, subrotund. Capsules longer than the gynophore, viscous-pubescent.

Distribution: Native of America.—Planted in Indian gardens.

This American species is used as a stomachic and as a vulnerary.

6. **Cleome chelidonii** Linn. f. Suppl. (1781) 300.

Annual, erect much-branched, 0.3—0.9 m. high; stem and branches striate, glabrous except for a few scattered hairs from glandular bases. Leaves 3—9—(commonly 7—) foliolate, (the number of leaflets diminishing upwards), passing into simple, linear bracts above; leaflets up to 6.3 cm. long, oblong-obovate, or the upper narrow-linear, appressedly pubescent; petioles reaching 10 cm. long, glabrous except for a few glandular hairs. Flowers rosy, in terminal and axillary racemes, becoming corymbose; pedicels 2.5—3.8 cm. long. Sepals small, ovate, acute. Petals 1—1.3 cm. long, obovate, mucronate. Stamens indefinite. Capsules 5—10 cm. long, slender, cylindric, tapering at both ends, finely striate. Gynophore 0. Seeds yellowish brown, echinate.

Distribution: N. Circars, most places throughout the Bombay Presidency.—Java.

In Indo China the roots are considered to be vermifuge. An infusion of the plant is commonly used in gingivitis and in the treatment of skin diseases.

Indo China: Man man—; *Porebunder:* Ubhitalvani.

Gynandropsis DC.

Annual herbs, usually glandular-pubescent. Leaves 3—7-foliolate. Flowers racemose. Sepals 4, spreading, deciduous. Petals 4, with long slender claws, imbricate or open in bud. Stamens 6; filaments adnate to a slender gynophore, spreading above, subequal. Ovary stalked; ovules many. Capsule usually stalked, compressed or subterete, usually elongate. Seeds reniform or orbicular; testa rugose; cotyledons incurved, accumbent.—Species 15.—Tropical and subtropical.

G. gynandra Merrill is used medicinally in every country where it is found growing.

1. **Gynandropsis gynandra** Merrill Enum. Philip. Pl. II (1923) 209.—*Cleome gynandra* Sp. Pl. (1753) 671.—*Gynandropsis pentaphylla* DC. Prodr. I (1824) 238.—*Cleome pentaphylla* Linn. Sp. Pl. (1753) 671; Roxb. Fl. Ind. III, 126.—Plate 70B (under *G. pentaphylla* DC.).

Annual, erect, branched, 0.6—1.2 m. high; stems and branches striate, more or less clothed with white spreading hairs. Leaves 3—5-foliolate; petioles 5—7.6 cm. long, sometimes armed with small distant prickles; leaflets subsessile, 2—4 by 1.2—2.5 cm., elliptic-obovate, obtuse, acute or accuminate, cuneate at the base, pubescent on both sides, margins crenate-dentate or subentire. Flowers at first corymbose, elongating into a dense bracteate raceme; pedicels 1.2—2 cm. long, viscid-pubescent; bracts subsessile, trifoliolate, with small obovate leaflets. Sepals lanceolate, glandular-pubescent, green with white veins. Petals pale pink, 15 mm. long, broadly obovate or suborbicular with a long narrow claw. Gynophore 2—2.5 cm. long. Stamens purple, inserted about ½ way up the gynophore. Ovary linear-oblong, glandular, seated on the top of the gynophore; style almost 0. Capsules 5—9 cm. by 4.5 mm., viscid-pubescent, tapering at both ends, obliquely striate. Seeds muricate, dark brown.

Distribution: A common weed in all tropical countries.

The root has a hot sharp taste; removes "vata'" stomachic; good in ascites, tumours, ulcers, pain, earache, spleen enlargement, and bilious fevers; the yellow variety good as a collyrium (Ayurveda).

In combination with other drugs the root is recommended for the treatment of snake bite (Sushruta) and scorpion sting (Charaka).

A decoction of the root is said to be a mild febrifuge.

The leaves are applied externally to boils to prevent the formation of pus. The bruised leaves are rubefacient and vesicant, producing a very copious exudation, affording in many cases the relief obtained from a blister without its inconveniences. The expressed juice is a popular remedy, in high repute as a local application in otalgia, both among the natives of India and the settlers in the West Indies, where the plant is also indigenous.

In the Gold Coast the juice of the leaves is commonly used for curing earache and sometimes for curing headache. As it causes pain when applied freely to the eye or the ear it should be used with care.

The Shangaans of South Africa apply the pounded leaf as a counter-irritant in rhematism, neuralgia, headache, and a stiff neck, taking care to withdraw the application before it produces a blister.

The seeds are anthelmintic and rubefacient, and are employed internally for the expulsion of round worms, and, externally as a counter-irritant. They are used as a substitute for mustard, and yield a good oil.

In Lakhimpur (Assam), a paste of the seeds is applied locally in headache (Carter).

In the Rajputana Desert the seeds infused in boiling water are used as a cure for coughs; bruised, they are applied as a poultice to sores that have maggots in them (Blatter).

In Indo China the plant is used as an antiscorbutic. In La Reunion it is mostly used as a diaphoretic, and as an emollient in the form of poultice.

A reputed cure for cobra bite in Ceylon; the bruised roots, leaves, and seeds are applied to the wounds (Roberts).

The plant is not an antidote to snake and scorpion venom; and it is useless as an external application in the treatment of snake bite (Mhaskar and Caius) or scorpion sting (Caius and Mhaskar).

Ashanti: Tete—; *Awuna:* Sorbui—; *Bengal:* Ansarisha, Arkahuli, Hulhul, Hurhur, Hurhuria, Kamala, Karaila, Sadahur-

huria—; *Bombay:* Mabli, Tilavana—; *Chinese:* Pai Hua Ts'ai—; *Deccan:* Halhal—; *Ewe:* Sorlwi—; *Ga:* Kete, Tete—; *Gujerati:* Adiyakharan, Satitalvani, Tanmani—; *Hausa:* Gasaya—; *Hindi:* Churota, Hulhul, Hurhur, Karalia, Lalhulhul, Safedhulhul—; *Indo China:* Man ma tia—; *Kano:* Gasaya—; *Krobo:* Tete—; *La Reunion:* Pissat de chien—; *Malay:* Maman—; *Malayalam:* Karavela, Taivela, Vela—; *Marathi:* Kanphodi, Mabli, Motitilavan, Pandharitilavan, Tilavana—; *Mundari:* Carman, Ciarmari, Marangcarmani—; *New Caledonia:* Oua meti hakon—; *North-Western Provinces:* Kathalparhar—; *Philippines:* Cincocinco, Silisihan—; *Porebunder:* Dholitalvani, Gandharitalvani, Satitalvani—; *Rajputana Desert:* Pagra—; *Sanskrit:* Ajagandha, Arkapushpika, Avigandha, Barbaragandha, Bastagandha, Bodhayika, Bramhagrabha, Brahmi, Choraka, Hulhul, Kabari, Karnaspota, Kharapushpa, Putimayurika, Sugandhika, Surjavarta, Tilaparni, Tungi, Ugragandha—; *Santal:* Setakataarak—; *Sind:* Kinro—; *Sinhalese:* Vela—; *Sokoto:* Yarungawa—; *Tagalog:* Apoyapayan, Balabalanoyan—; *Tamil:* Kadugu, Nayvelai, Velai—; *Telugu:* Vaminta, Velakura—; *Twi:* Tete—; *Visayan:* Hulaya—.

MAERUA Forsk.

Climbing unarmed shrubs, often glaucous. Leaves simple, quite entire. Flowers corymbose. Sepals 4, united at the base into a persistent infundibuliform tube forming a 4-lobed calyx; lobes valvate. Petals 4, smaller than the calyx-lobes, inserted on the edge of the cup-shaped disk. Disk infundibuliform, lining the calyx-tube, elongated in the middle into a columnar obconic receptacle or torus, equalling or slightly exceeding the calyx-tube. Stamens many, inserted on the torus; filaments free or connate at the base. Ovary seated on a long gynophore, 1—2-celled; placentas 2—4, parietal or cohering in the middle; ovules many; stigma subsessile. Berry fleshy, elongate, monilifor, 1—or more-seeded. Seeds large; cotyledons fleshy, convolute.—Species 40.—Tropical Africa and Asia.

Medicinally the genus is unimportant.

M. angolensis DC. is said to be toxic.

1. **Maerua arenaria** Hook. f. & Th. in Hook. f. Fl. Brit. Ind. I, 171.—*M. ovalifolia* Cambess. in Jacquem. Voy. Bot. (1844) 23, t. 24.—*Niebuhria oblongifolia* Royle III. Bot. Himal. 73.—*Capparis heteroclita* Roxb. Fl. Ind. II, 570—PLATE 70A.

A climbing shrub with divaricate branches; bark smooth, pale. Leaves 2.5—5 by 1—2.5 cm., elliptic-oblong, obtuse or retuse, mucronate, glaucous, glabrous; petioles stout, 3—6 mm. long. Flowers in corymbs, greenish white, terminal or on lateral shoots; pedicels 1.2—2 cm. long, glabrous; bract 1 at the base of each pedicel, small, ovate, accuminate, rigid, yellow. Calyx-lobes ovate, acute 12 mm. long, hooded at the apex, with a short horn behind the hood and with a line of dense white pubescence on the margin. Calyx-tube 3 mm. long, lined with an infundibuliform disk as long as the tube with truncate margins, the columnar torus slightly exceeding the calyx-tube. Petals ovate-lanceolate, acute, with slightly undulate margins, half as long as the calyx-lobes and alternate with them or nearly so, inserted on the margin of the cup-shaped disk. Stamens many, inserted on the torus. Gynophore 2 cm. long. Ovary cylindric, truncate; style 0; stigma large. Fruit pale brown constricted between the seeds, forming an elongate twisted and knotted berry, each lobe or knot 1-seeded. Seeds brown, globose, echinate.

Distribution: Punjab, Sind, Gujarat, Deccan, Central and S. India, Ceylon.

The root is said to be used as an alterative, tonic, and stimulant.

Cutch: Dhoropinjero, Katkiyal—; *Gùjarat:* Vika—; *Porebunder :* Dholokatkiyo, Dudhiyohemkand, Hemkand—; *Tamil :* Bhumichakkarai, Mulmurandai—; *Telugu :* Bhuchakramu, Makamettanitige, Menikatige, Morinika, Pattatige, Pattutige—.

CRATAEVA Linn.

Trees. Leaves 3-foliolate. Flowers in axillary and terminal corymbs, handsome, usually polygamous. Sepals inserted on the edge of the disk, deciduous, imbricate. Petals 4, with long claws, open in bud. Disk hemispheric, lobed, lining the bottom of the calyx. Stamens 8—20, inserted on the margin of the disk; filaments filiform, elongate. Ovary ovoid, on a long gynophore, 1—2-celled;

placentas 2; ovules many, in many series; stigma sessile, discoid. Berry rather large, globose or ovoid. Seeds few or many, reniform, imbedded in pulp.—Species 10.—Tropics.

C. religiosa Forst. is used medicinally in Indo China and the Philippine Islands, *C. tapia* Linn. in Brazil and Guiana.

1. **Cratæva nurvala** Ham. in Trans. Linn. Soc. XV (1827) 121.—*C. religiosa* Hook.f. & Th. in Hook.f. Fl. Brit. Ind. I, 172 (non Forst.—*C. religiosa* var. *nurvala* Hook.f. & Th. lc.—PLATE 71A. (under *C. religiosa*).

A small tree with a much-branched head. Leaves deciduous, 3-foliolate; petioles 3.8-7.6 cm. long; leaflets 5-15 by 3.8-6.3 cm. ovate, lanceolate or obovate, acute or acuminate, attenuate at the base, entire, glabrous on both surfaces, pale beneath and reticulately veined, the lateral leaflets oblique at the base; petiolules 6-9 mm. long. Flowers many, in dense terminal corymbs, greenish white; pedicels 2.5-4.4 cm. long stout, glabrous. Sepals petaloid, small, distant, ovate, acute. Petals (including the claw) nearly 2.5 by 0.9 cm.; claw up to 6 mm. long, very narrow. Stamens longer than the petals, spreading. Gynophore nearly 5. cm. long, terete, smooth. Ovary ellipsoid; stigma flat. Fruit a globose or ovoid, woody, smooth or scurfy berry, on the thickened gynophore. Seeds imbedded in pulp, nearly smooth, brown. The filaments of the stamens are purple or white when young, lilac when old; the gynophore is lilac; the sepals green when young, yellow or pale pink when old; the petals whitish when young, yellowish when old.

Distribution: Almost all over India and Burma, wild or cultivated. Often found along streams, but also in dry deep boulder formations in the sub-Himalayan tract.

The bark is hot, bitter at first, and then sweet sharp taste; easy to digest; stomachic, laxative, antilithic, vesicant, anthelmintic, detergent, bechic, expectorant; removes "vata;" good in strangury, diseases of the chest and the blood, tuberculous glands; causes biliousness.—. The flowers are astringent and cholagogue.—. The fruit is sweet and oily; laxative; removes "vata," "pitta," and "kapha" (Ayurveda).

The bark promotes appetite, decreases the secretion of the bile and phlegm, and removes disorders of the urinary organs (Yunani).

The plant in combination with other drugs is recommended for the treatment of snake bite (Sushruta) and scorpion sting (Charaka). In Ceylon the bruished roots, leaves and seeds are applied to the wounds (Roberts).

The bark is demulcent, antipyretic, sedative, alterative, and tonic; and the fresh leaves and root-bark are rubefacient.

The bark is useful in some cases of urinary complaints and fever, and in some mild forms of skin diseases in which sarasaparilla is generally resorted to. It also relieves vomiting and other symptoms of gastric irritation. The fresh leaves and root-bark, particularly the former, are very efficacious in all the affections in which mustard poultice is indicated.

Bruised well with a little vinegar, lime-juice or hot water and applied to the skin in the form of a poultice or paste, the fresh leaves act as a rubefacient and vesicant.

In Ceylon the leaves are used for gouty swellings. In Bombay they are a remedy for swelling of the feet, and a burning sentation in the soles of the feet. In the Konkan the juice is given in rheumatism. In caries of the bones of the nose, the leaf is smoked and the smoke exhaled through the nose.

A couple of buds pounded with salt are taken before meals to promote the appetite. In indigestion they must be given after meals.

The bark and the leaves are equally useless in the antidotal treatment of snake bite (Mhaskar and Caius) and the symptomatic treatment of scorpion sting (Caius and Mhaskar).

Bengal: Barun, Tiktoshak—; *Bombay:* Bhatavarna, Hadavarna, Kawan, Kumla, Vayavarna, Waruna—; *Burma:* Kadat, Kadet, Katat—; *Canarese:* Bilpatri, Bitusi, Hoddelenage, Mavilinga, Narave, Neravambele, Neravele, Tudemadirenge, Vitusi—; *Central Provinces:* Bel, Bela—; *Coorg:* Nerajane, Nirajani, Vittasi—; *Gujerati:* Varno, Vayavarno—; *Hansot:* Kagdakeri—; *Hindi:* Barna, Barun, Bila, Bilasi, Biliana, Varvunna—; *Konkani:* Nervol—; *Lepcha:* Purbong—; *Malay:* Cadat—; *Malayalam:* Kili, Niravila, Nirumaliyan, varana, Vitusi—; *Marathi:* Haravarna, Karvan, Kumla, Nirvala, Ramala, Varun, Vayavarna—; *Meehi:* Bunboronda, Tailadu—; *Punjab:* Barna, Barnahi—; *Rajputana:* Barna, Barnahi—; *Saharanpur:*

Barna—; *Sanskrit:* Ajapa, Ashmarygna, Barhapushpa, Kumara, Kumaraka, Mahakapittha, Marutapaha, Pasunadha, Sadhuvriksha, Setuka, Setuvriksha, Shikhimandal, Shvetadru, Shvetadruma, Shvetavriksha, Tamala, Tiktashaka, Urumana, Varana, Varuna, Vasaha—; *Sinhalese:* Lunuwarana—; *Tamil:* Adicharanam, Adimalam, Anjali, Inaivilai, Kattumavilangai, Kuvilam, Maluram, Maralingam, Mavilangai, Miguttiyal, Narvala, Nilluvam, Nirumaliyam, Periamavilangai, Shuppigam, Shuvedan, Sinnamavilingam, Tiriburamerittan, Varanam, Villuvam—; *Telugu:* Bilvaram, Chinnavulimidi, Magalingam, Maredu, Peddamagalingam, Peddavulimidi, Tellavulimidi, Ulimidi, Urumudu, Usiki—; *Urdu:* Barna—; *Uriya:* Boryno—.

CADABA Forsk.

Unarmed shrubs. Leaves simple or trifoliolate. Flowers axillary, solitary, racemose or corymbose. Sepals 4, unequal or 2-seriate, the 2 outer valvate. Petals 2-4, rarely O, clawed. Disk prolonged into a trumpet-shaped or spathulate process with a tubular claw. Stamens 4-6; filaments filiform, exserted, spreading. Ovary 1-celled, on the top of a long gynophore; ovules many, on 2-4 parietal placentas; stigma sessile. Fruit fleshy, long, cylindric, berried, or dehiscing tardily by 2 valves which leave the pulpy placentas. Seeds subglobose; testa cartilaginous; cotyledons convolute. — Species 20. —Palaeotropics.

1. Leaves ovate or oblong-obtuse .... 1. *C. farinosa.*
2. Leaves palmately 3-foliate .... 2. *C. trifoliata.*

Therapeutically the genus is of no importance.

1. **Cadaba farinosa** Forsk. Fl. Aeg.-Arab. (1775) 68.—*C. indica* Lam. Encycl. I (1783) 544.—*Stroemia tetrandra* Vahl Symb. Bot. I, 20; Roxb. Fl. Ind. II, 78.—PLATE 72 and PLATE 71B (under *C. indica* Lam.).

An unarmed, straggling, much-branched shrub, up to 3 mm. high. Stems terete, the older smooth, purplish, the younger pubescent, yellowish brown. Leaves 12-35 by 8-12 mm., simple, entire, elliptic-oblong, or ovate, or oblong, obtuse or retuse, mucronate dull green,

mealy when young glabrous when mature, reticulately veined, base rounded; petioles 2.5-4 mm. long. Flowers dirty white, 15 mm. across, in few-flowered, terminal, 1-sided racemes, the upper flowers corymbose; pedicels 9-18 mm. long, pubescent; bracts minute, subulate. Sepals 8-13 mm. long, the two outer boat-shaped, valvate, the two inner flat, ovate, acute, petaloid, all pubescent outside. Petals 4, very pale yellow, spathulate, equalling the sepals; claws long, slender. Disk prolonged into a tubular process, 8-9 mm. long, mouth oblique, pale rose coloured, toothed at apex. Stamens 4 or 5 inserted about half-way up the gynophore; filaments long. Ovary oblong on a gynophore 17-23 mm. long, style O. Fruit 2.5-t cm. by 3 mm., cylindric, irregularly torulose, glabrous or pubescent. Seeds many, striate, surrounded by an orange-red aril.

Distribution: Punjab, Baluchistan, Sind, Rajputana Desert, Central India, Gujerat, Konkan, S. M. Country, dry districts of the N. Circars, Deccan and Carnatic from Vizagapatam southwards, Madura district.—Arabia, tropical Africa.

The leaves and root are considered deobstruent and anthelmintic, and are prescribed in decoction in uterine obstructions (Murray).

Bombay: Habab—; *Canarese:* Chegaviche, Maragache, Shegurti—; *Cutch:* Budkiyal, Janglimirchi, Karopinjero—; *Gujerati:* Khordu—; *Hausa:* Bagayi—; *Hindi:* Kodhab—; *Katagum:* Anza—; *Madras:* Viludi—; *Malayalam:* Kattakatti—; *Porebunder:* Kalokattiyo, Kimiyatunjadvung Thaniung—; *Sind:* Kodhab—; *Tamil:* Kattagatti, Vili—; *Telugu:* Adamorinika, Chavukuttiyanku, Chemudu, Chikonadi, Chimurudu, Polumokinika—; *Tigre:* Astan—; *Tigrinia:* Sernak, Tueblischnai—.

2. **Cadaba trifoliata** Wight & Arn. Prodr. 24.

A large, straggling, much-branched shrub, bark smooth, grey. Leaves 3-foliolate, leaflets very shortly stalked, 3.8-7.5 cm., lanceolate, acute at both ends, entire, glabrous, petioles 2.5-3.8 cm. Flowers few, in short terminal corymbs, pedicels 3.8 cm., spreading; sepals ovate, 2 outer larger, pubescent outside; petals 2, large, 4.5 cm., roundish-ovate, acute, with a long, slender claw; disk-process 2 cm. long, erect between the petals, hollow, dilated at the end; gynophore 5 cm.; stamens 6; ovary small, linear, truncate. Fruit about 7.5 cm., linear, cylindrical, blunt, usually curved, soft, smooth, green. Seeds reniform, finely muriculate.

Distribution: Carnatic, Ceylon.

The roots and leaves are purgative, emmenagogue, anthelmintic, antiphlogistic; useful in indigestion of children, amenorrhoea, dysmenorrhœa, painful joints (Ayurveda).

Sanskrit: Balaya—; *Tamil:* Manudukkurundu, Viluti—; *Telugu:* Chekonadi—.

Capparis (Tourn.) Linn.

Trees or shrubs, often scandent, unarmed or with stipular thorns. Leaves simple, rarely O. Inflorescence various; flowers white or coloured, often showy, usually bracteate. Sepals 4, free or connate at the very base, in 2 series, imbricate, or the 2 exterior subvalvate. Petals 4, imbricate. Torus short. Stamens usually many, inserted on the torus at the base of a long gynophore. Ovary stalked, 1-4-celled; ovules many, on 2-6 parietal placentas; stigma sessile. Berry stalked, globose or cylindric, often elongate, rarely dehiscent. Seeds many, imbedded in pulp; testa crustaceous or coriaceous; embryo convolute.—Species 200.—Warm countries.

For a fuller explanation of the changes made in the nomenclature of this genus see Blatter, Revision Fl. Bombay Presidency in Journ. Bomb. Nat. Hist. Soc. XXXI (1927) 902.

A. Flowers axillary, solitary or in fascicles of 2-3
  I. Prostrate shrubs. Leaves orbicular or ovate-orbicular. Thorns usually hooked. Lower sepal not very saccate .. 1. *C. spinosa.* ..
  .. II. Erect shrub. Leaves elliptic-lanceolate. Thorns minute or absent .... 2. *C. heyneana.*
B. Flowers corymbose (sometimes racemose in C. grandis).
  I. Mature branches leafless .... 3. *C. decidua.*
  II. Mature branches leafy. Leaves olive-green, pubescent when young .... 4. *C. grandis.*
C. Flowers in shortly peduncled or sessile umbels. Woody climber .... 5. *C. sepiaria.*
D. Flowers supra-axillary in a vertical line on the branches. Young parts fuscoustomentose .... 6. *C. zeylanica.*

Stimulant, antiscorbutic, and antispasmodic.

C. coriacea Linn. is used medicanally in Peru and Bolivia; *C. spinosa* Linn. in Europe; *C. citrifolia* Lam., *C. gueinzii* Sond., *C. tomentosa* Lam. in Southern Africa.

1. **Capparis spinosa** Linn. Sp. Pl. (1753) 503.—*C. spinosa* var. *vulgaris* Hook.f. & Th. in Hook.f. Fl. Brit. Ind. I (1875) 173.—*C. leucophylla* DC. Prodr. I, 246; Collett Fl. Siml. 38.—Plate 73A.

A diffuse, prostrate shrub; branches terete, glabrous or pubescent. Leaves variable, 1.2-3 cm. diam., glaucescent, obricular or from broadly ovate to obovate, retuse or sometimes acute, mucronate, entire, rounded or cuneate at the base, glabrous or more or less pubescent; petioles about 3 mm. long; stipules of 2 hooked (rarely straight), orange-coloured thorns. Flowers handsome, axillary, solitary; pedicels 2.5-5 cm. long, thickened in fruit. Sepals subequal. Petals white, 2.5-3.2 cm. long, exceeding the sepals. Filaments purple, longer than the petals. Gynophore 5-7.6 cm. long. Fruit 2.5-5 cm. long, obovoid, ribbed, red when ripe. Seeds globose, smooth, brown.

Distribution: Plains between the Indus and Jhelum, Salt Range, low inner valleys of the Himalaya, Chamba, Kumaon, Nepal; Bombay Pres.: Sind Konkan, Deccan, W. Ghats; Baluchistan, Waziristan.—Aghanistan, Mediterranean, N. Africa, Australia.

The root-bark is bitter, hot and dry; aperient, tonic, expectorant, anthelmintic, emmenagogue, analgesic; good in rheumatism, paralysis, toothache, enlarged spleen, tubercular glands; the juice kills worms in the ear (Yunani).

The dried bark of the root is considered diuretic. In Kangra, the macerated roots are applied to sores (Stewart).

In Ormara and Las Bela a jelly is prepared from the fruits and is considered to be a cure for rheumatism and for snake bite (Hughes-Buller). The berries are crushed. They give a lot of juice, but, if they are dry, a very little water is added, and the juice is poured, not heated, into the ear as a cure for ear-ache (Hotson).

In Europe the flower buds and fruits are considered aperient and diuretic. The young flower buds are the capers of the shops; they are esteemed antiscorbutic, stimulant, and aperient. The bark of the root passes for a diuretic. The leaves are bruised and used as poultices for gouty affections.

Afghanistan: Kabarra, Kabawa—; *Arabic:* Azuf, Kabar, Kabbar, Kabur—; *Bombay:* Kabar—; *Canarese:* Mullukattari—; *Catalan:* Taparera—; *Diwana:* Pahinro—; *Dutch:* Kapperboom—; *English:* Caper Plant—; *French:* Caprier, Tapenier—; *German:* Kapernbaum—; *Greek:* Kaparis—; *Hebrew:* Ezov—; *Hindi:* Ber, Kabra—; *Italian:* Capparo, Cappero—; *Jaunsar:* Bauri, Kiari—; *Jhalawan:* Khafkhander, Khakandir—; *Kumaon:* Bussar Ultakanta—; *Ladak:*

Kabra—; *Las Bela:* Kirap, Krap, Pahinro, Panetero—; *Malta:* Caper-plant, Capparo, Cappero, Cappara—; *Northern Baluchistan:* Khawarg—; *Ormara:* Kirap, Krap—; *Persian:* Kabar, Kebir, Kurak—; *Portuguese:* Alcaparra—; *Punjab:* Bandar, Barar, Barari, Bassar, Bauri, Ber, Kabarra, Kabra, Kakri, Kander, Kaur, Keri, Kiari, Taker—; *Russian:* Kapersovyi kust—; *Sind:* Kalvari—; *Spanish:* Alcaparra, Alcaparro—; *Syria:* Kabar—; *Telugu:* Kokilakshamu—; *Tibet:* Kabra—; *Turkish:* Kabarish—; *Urdu:* Kabar—.

2. **Capparis heyneana** Wall. Cat. (1828) 6985.—Rheede Hort. Mal. VI, t. 57.—PLATE 73B.

An erect shrub, unarmed or with minute, straight, stipular thorns. Leaves 7.5-12.5 by 2.5-5 cm., elliptic-lanceolate, acute or acuminate, narrowed at the base, reticulately veined, the younger clothed with ferruginous, stellate tomentum, the older glabrous, shinning above; petioles 6 mm. long. Flowers very large, 10-12.5 cm. diam., white or pale blue, arranged in corymbose, 2-6-flowered racemes, terminal or at the ends of short axillary branches; pedicels 2.5-3.8 cm. long and together with the subulate bracts ferrugino tomentose. Sepals obtuse, tomentose within. Petals flat, obovate, spreading, the 2 lower much approximated and with a yellow, pubescent, basal spot. Filaments as long as the petals. Gynophore 2.5-3.8 cm. long. Ovary oblong, tomentose. Fruit not seen.

Distribution: W. Ghats of S. Konkan and N. Kanara to Tinnevelly District, Ceylon.

The leaves are used for rheumatic pains in the joints, and the flowers are made into a laxative drink.

Hindi: Chayruka.

3. **Capparis decidua** Edgew. in Journ. Linn Soc. VI (1862) 184; Blatter Fl. Arab. (1919) 44.—*Sodada decidua* Forsk. Fl. Aeg.-Arab. (1775) 81.—*Capparis aphylla* Roth. Nov. Pl. Sp. (1821) 238. —PLATE 75 (under *C. aphylla* Roth.)

A straggling, glabrous shrub; branches terete, smooth, green. Leaves on the young shoots only (the older branches leafless), small, less than 12 mm. long, linear-oblong, acute, spinous-pointed; petioles very short or O; stipular thorns long, sharp, straight, orange-yellow. Flowers in many-flowered corymbs, from the old branches, or from short lateral shoots; pedicels slender, about 12 mm. long. Sepals:

The outer pubescent, ciliate, subvalvate, the lower sepal very saccate, acuminate, the upper much smaller, ovate-oblong, concave; inner sepals elliptic, acute, with floccose margins. Petals red, narrow-oblong, 9 by 3 mm. Gynophore 12 mm. long. Fruit globular, size of a small cherry, glabrous, beaked.

Distribution: Sind, Baluchistan, W. Rajputana, Punjab, C. India, Gujerat, Deccan, Tinnevelly.—Arabia, Socotra, Egypt, tropical Africa.

The bark has an acrid, sharp, hot taste; analgesic, diaphoretic, alexeteric, laxative, anthelmintic; good in cough and asthma, ulcers and boils, vomiting, piles, and all inflammations.—. The fruit has a sharp hot taste; astringent to the bowels; destroys foul breath, biliousness, and urinary purulent discharges; good in cardiac troubles (Ayurveda).

The plant has a bad smell and taste; carminative, tonic, emmenagogue, aphrodisiac, alexipharmac; improves the appetite; good for rheumatism, lumbago, hiccough, cough, and asthma (Yunani).

In the Punjab, the top shoots and young leaves are made into a powder and used as a blister (Stewart); they are also used in boils, eruptions and swellings, and as an antidote to poison; also in affections of the joints (Baden Powell).

They are very efficacious in relieving toothache when chewed (Murray).

The fresh young twigs (tips only) are crushed and soaked in water. The water is strained off. Sometimes this is done twice or thrice. The residuum is dried and allowed to solidify. A tiny piece of it is eaten with butter and gives relief from pain after a bruise or fall. Also makes a very strong plaster (Hotson).

Arabic: Hanbag, Margh, Sodab, Tundub—; *Baluchistan:* Kaler, Kalir, Karar, Khirar—; *Bihar:* Kari—; *Bombay:* Kari—; *Canarese:* Chippuri, Karira—; *Deccan:* Karyal—; *Gujerat:* Ker, Kera—; *Hindi:* Karel, Karer, Karu, Kurrel, Lete, Satari—; *Konkani:* Kiral—; *Marathi:* Karil, Ker, Nevati—; *North-Western Provinces:* Kair, Kari, Karil—; *Persian:* Bergesodab—; *Punjab:* Delha, Karia, Karil, Karis, Kerin, Kirra, Pinju, Tenti—; *Sanskrit:* Granthila, Gudhapatra, Kantaki, Karaka, Karira, Kataphala, Krakatha, Krakara, Krishashakha, Marubharuha, Mriduphala, Nishpatra, Nishpatrika, Shakapushpa,

Shatakunta, Shonapushpa, Suphala, Tikshnakantaka, Tikshnasara, Ushnasundara, Vidahika, Vishvakpatra—; *Sind:* Dorakiram, Kirab, Kiral, Kirrur—; *Tamil:* Kulaladondai, Sengam, Sirakkali—; *Telugu:* Kariramu—; *Urdu:* Titali—.

4. **Capparis grandis** Linn. f. Suppl. (1781) 263.—*C. bisperma* Roxb. Fl. Ind. II, 568.

A small tree; young shoots covered with olive-green tomentum. Leaves 2.5-[illegible] by 2.5-3.8 cm., elliptic-obovate, obtuse (rarely retuse), sometimes mucronate, the younger clothed with olive-green velvety pubescence, the older subglabrous, except the midrib; petioles 6-12 mm. long; stipular thorns usually absent, when present hooked. Flowers about 2.5 cm. diam., in terminal, many-flowered, densely pubescent corymbs, or sometimes in racemes the lower pedicels of which are furnished with stalked, leafy, the upper with small, deciduous bracts; pedicels 1.8-2.5 cm. long. Sepals: the outer 6-8 mm. long, covered with olive-coloured pubescence outside, boat-shaped, valvate; the inner broadly eiliptic, ciliate, Petals oblong-obovate, the inner surface pubescent. Gynophore usually 1.8-2.5 cm. long, sometimes only 3 mm. Ovary ovoid, very acute, glabrous. Fruit the size of a nutmeg, subglobose, purple, smooth, 2-6-seeded.

Distribution: Mt. Abu, W. Rajputana, Kanara, Carnatic, hill-forests of the Deccan, eastern slopes of the W. Ghats from the Godaveri southwards.

In Western Rajputana an infusion of the bark and leaves is used internally for swellings and eruptions (Macaden).

Bombay: Puchaonda, Ragota—; *Burma:* Hkaw-kwa—; *Canarese:* Revapi, Tarate, Totte, Tottulla—; *Deccan:* Pachaonda—; *Gujerati:* Dhuti—; *Konkani:* Ragot—; *Lambadi:* Kaldero—; *Malayalam:* Waghutty—; *Marathi:* Kandel, Katarni, Kauntel, Pachenda, Puchunda, Ragot—; *Porebunder:* Dhuti—; *Rajputana:* Antera—; *Tamil:* Nakkulinjan, Turattu, Vellaitturattu—; *Telugu:* Oridonda, Dudduppi, Guli, Nalluppi, Regutti—.

5. **Capparis sepiaria** Linn. Syst. ed. 10 (1759) 1071; Camb. in Jacquem. Voy. Bot. t. 22.—*C. incanescens* DC. Prodr. I, 247; Hook. Ic. Pl. t. 123.—PLATE 76.

A much-branched, woody climber; young shoots more or less pubescent. Leaves 2-4 by 1.2-2.2 cm., oblong-elliptic or obovate,

obtuse, emarginate, rarely acute, the younger more or less pubescent, the older glabrous; petioles 2.5-4 mm. long, pubescent; stipular spines hooked. Flowers white, 6-9 mm. diam., in dense, short-peduncled or sessile umbels; pedicels 1.2-2 cm. long, filiform. Gynophore 6-9 mm. long, filiform. Ovary ovoid, pointed glabrous or very minutely pubescent. Fruit 6-9 mm. diam., globose, smooth, black when ripe.

Distribution: Dry parts of India and Ceylon.—Indo-China, Malaya, Timor, Australia.

Four kinds. The plant has a hot sharp bitter taste; tonic stomachic; improves appetite; removes "kapha" and "vata;" cures fevers, blood troubles, tumours, inflammations, diseases of the muscles. The ground root as an errhine is a cure for the bite of the snake *Godheraka* (?) (Ayurveda).

The plant possesses febrifugal properties. It is considered to be alternative and tonic, and it has been found useful in skin diseases.

Bengal: Kaliakara, Kantagurkamai—; *Canarese:* Kadukattari—; *Gujerat:* Kantharo—; *Hindi* Hiun, Kanthari—; *Marathi:* Kanthar, Kantharyel—; *Merwara:* Katan, Kataran—; *Porebunder:* Kalokantharo, Kantharo—; *Punjab:* Hiungarna, Hius—; *Sanskrit:* Ahimsra, Amlaphala, Dupravesha, Durdharsha, Guchchagulmika, Gridhranakhi, Hinsra, Jali, Kakadani, Kakatinduka, Kantha, Kanthari, Kantharika, Kanya, Kapalakulika, Krishnashriphalika, Kruragandha, Krurakarma, Tikshnagandha, Tikshnakantaka, Vakrakantaki, Vayastinduka—; *Tamil:* Karindu, Karunjurai, Kattukkattiri, Kokkimullu, Sirukkattiri —; *Telugu:* Nallapuyyi, Nallavuppi, Nalluppi, Puyyi, Uppi—; *Uriya:* Hulubhi, Koli, Kontoko, Nibido, Otaibe, Solorakoli—.

6. **Capparis zeylanica** Linn. Sp. Pl. ed. 2 (1762) 720; Roxb. Fl. Ind. II, 567.—*C. horrida* Linn.f. Suppl. (1781) 264; Wight Ic. t. 173; Brandis Ind. Trees 14; Hook.f. & Th. in Hook.f. Fl. Brit. Ind. I, 178.—Plate 74 and Plate 77 (under *C. horrida* Linn.f.).

A climbing shrub; branches terete; young parts clothed with rufous tomentum. Leaves 2.5-7.5 by 1.8-5 cm., elliptic-oblong, obtuse, acute or retuse, with a long, stout mucro, narrowed at the base, reticulately veined, glabrous and shining above; petioles 6 mm. long; stipular spines hooked. Flowers supra-axillary, solitary or 2-3, one above the other in a vertical line, the upper the longest. Sepals

9 mm. long, densely rufous-pubescent outside, very concave. Petals twice as long as the sepals, densely villous. Gynophore 3.2 cm. long. Ovary ellipsoid, apiculate. Fruit subglobose, 3.2 cm. diam., on a greatly thickened stalk, obtusely 4-angled, red-brown. Seeds many.

Distribution: Throughtout the Greater part of India to Java and the Philippines.

Root bark bitter; cooling, cholagogue; removes "kapha." Fruit sweet, removes "tridosha;" but, according to some, bitter, removes "khapa" and "vata" (Ayurveda).

The root-bark is sedative, stomachic and antihidrotic.

In Northern India, the leaves are used as a counter-irritant and as a cataplasm in boils, swellings and piles (Atkinson).

In Chota Nagpur, the bark, along with native spirit, is given in cholera (Campbell).

A chemical examination of the root bark has been reported on by Chakravarti and Venkatasubban (20th Ind. Sc. Congress; Patna, 1933).

Ajmere: Gitoran—; *Bengal:* Kalokera—; *Bombay:* Anti, Taranti, Tarti, Wag, Wagatti—; *Burma:* Nahmanitanget, Nahmanithanlyet, Nwamanithanlyet—; *Canarese:* Mullukattari, Totte, Tottulla—; *Ceylon:* Vennachi—; *Deccan:* Ardanda—; *Gond:* Katerni—; *Hindi:* Ardanda—; *Ilocano:* Talactac—; *Konkan:* Govindphal, Wageti—; *Kumaon:* Bipuwakanta, Ultakanta—; *Marathi:* Govindi—; *Monghyr:* Bagnai—; *Mundari:* Gaterna, Kularama, Ramakula—; *Oudh:* Karrallura—; *Punjab:* His, Hiungarna, Karvila—; *Sanskrit:* Govindi, Granthila, Kantakalata, Karambha, Katukandari, Kinkani, Krishangi, Tapasapriya, Vartala, Vyaghraghanti, Vyaghrapada, Vyagranakhi—; *Sind:* Ardanda—; *Sinhalese:* Welangiriya—; *Tagalog:* Dauag—; *Tamil:* Adondai, Igudi, Indu, Kaguturatti, Kattotti, Migupalattam, Tondai, Tulambikkiri, Viyanicham—; *Telugu:* Adonda, Aridonda, Chittigara, Doddi, Palaki—; *Uriya:* Govindi, Lobhyotai, Osaro, Oserwa—; *Visayan:* Laguino—.

RESEDACEAE.

Herbs, rarely shrubs. Leaves alternate, entire or pinnatisect; stipules 0, or glandular. Flowers small, racemose or spicate, bracteate. Calyx persistent, 4-7-partite, irregular; lobes imbricate in bud. Petals 2-7, hypogynous, entire or lobed, equal, or the upper larger, open in bud. Disk conspicuous, hypogynous. Stamens usually many, seated on the disk, free or connate, equal or unequal. Ovary 1-celled, of 2-6 connate carpels, often lobed at the top and open between the lobes which bear the sessile stigmas; ovules on 2-6 parietal placentas, amphitropous or campylotropous. Fruit capsular, open at the top. Seeds many, reniform; albumen 0; embryo curved or folded; cotyledons incumbent.—Genera 6. Species 6.—Chiefly Mediterranean, also Europe, Asia, S. Africa, California.

1. Petals 4-7, lobed; ovary syncarpous .... RESEDA.
2. Petals 2; ovary syncarpous .... OLIGOMERIS.
3. Peltals 0; ovary syncarpous; fruit a berry .... OCHRADENUS.

This Order is of little therapeutical value.

Phenylethylisothiocyanate—mustard oil—is contained in the ethereal oil from the roots of RESEDA.

RESEDA Tourn. ex Linn.

Erect or decumbent herbs. Leaves entire, lobed or pinnatisect; stipules glandular. Flowers small, racemose, bracteate. Calyx 4-7-partite. Petals 4-7, unequal, multifid, the upper with a membranous appendage above the claw. Disk subsessile, broad, dilated on the upper side. Stamens 10-40, inserted within the disk. Ovary sessile or stalked, 3-lobed at the apex; placentas 3-6; ovules many. Capsule indehiscent, open at top. Seeds numerous.—Species 55.—Mediterranean, Europe, W. Asia.

The root is considered sedative, aperient, diaphoretic, and diuretic; the seeds are used as a resolvent.

The following are used medicinally: in Europe—*R. alba* Linn., *R. glauca* Linn., *R. lutea* Linn., *R. luteola* Linn., *R. odorata* Linn., *R. phyteuma* Linn.—; in North America—*R. luteola* Linn.

1. **Reseda odorata** Linn. Sp. Pl. (1753) 646; Reichb. Ic. II, fig. 4444.—PLATE 78.

An annual, glabrous herb, branched from the base. Leaves entire, spathulate, the upper ones often ternately incise. Racemes floriferous, short, ovoid; pedicels twice as long as the calyx; sepals linear-spathulate, as long as the corolla; filaments linear-subulate, scabridulous; capsules obovate-globose, torulose.

Distribution: Widely cultivated in Indian gardens.—Very likely indigenous in the Mediterranean region.

In Spain the acrid root is used as a laxative, diaphoretic, and diuretic; the seeds are applied externally as a resolvent.

Catalan: Mardugi—; *Dutch:* Reseda—; *English:* Mignonette—; *French:* Mignonette, Réséda—; *German:* Gartenreseda—; *Roumanian:* Roseta—; *Russian:* Roseda—; *Spanish:* Minoneta, Reseda—.

Oligomeris Camb.

Herbs. Leaves linear, entire, scattered or fascicled. Flowers small, in terminal spikes. Calyx 4-partite. Petals 2, distinct or connate at the base. Disk 0. Stamens 3-8, hypogynous; filaments free or monadelphous. Ovary sessile, 4-angled, 4-cuspidate; placentas 4, many-ovuled. Capsules angled, open at top. Seeds many.—Species 5.—Africa, W. Asia, India, N. America.

This genus is therapeutically inert.

1. **Oligomeris subulata** (Del.) Boiss. Fl. Or. I (1867) 435. —*Reseda subulata* Del. Ill. Fl. d'Eg. (1812) n. 464.—*Oligomeris glaucescens* Camb. in Jacquem. Voy. Bot. (1844) 24, t. 25.

An annual erect glaucous herb; stems many, erect, sulcate, glabrescent. Leaves sessile, 2.5-5 by 0.4 cm. narrow-linear, acute, glabrous. Flowers greenish white, in terminal spikes, the upper portion of the spikes dense, the lower lax; bract lanceolate, longer than the calyx. Calyx glabrous; lobes unequal, lanceolate, acute. Petals equalling the calyx, connate more than half-way up. Stamens 3, a little shorter than the petals; filaments connate at the base. Ovary sessile, depressed-globose, 4-cuspidate, 4-furrowed lengthwise; stigmas obtuse. Capsules very small, membranous. Seeds minute, shining, 0.6 mm. diam.

Distribution: Sind, Baluchistan, Punjab.—Afghanistan, Persia, Arabia, Mediterranean, W. North America.

In Kalat the plant is pounded and the juice thus extracted is used by women to put on to their breasts to keep them soft (Hughes-Buller).

Kalat: Shataki—.

OCHRADENUS Del.

Branched glabrous herbs or shrubs; branches slender, twiggy. Leaves small, linear, on the younger branches only, solitary or fascicled. Flowers small, spicate or racemose, often polygamous. Calyx 5-fid. Corolla 0. Disk unilateral. Stamens 10-20, inserted within the disk. Ovary sessile, ovoid, closed at the top, 3-cuspidate; placentas 3; ovules many. Fruit a many-seeded berry.—Species 5. —Mediterranean to Sind.

Therapeutically the genus is of small importance.

1. **Ochradenus baccatus** Del. III. Fl. d'Eg. (1812) 236, t. 31.

Shrubby, 1.8-3.6 m. high; branches terete, striate, glabrous. Leaves 1.2-4 by 0.2 cm., entire, scattered near the base of the branches, olive-green, fleshy, narrow-linear, spathulate, with a callous tip, glabrous. Flowers yellowish, minute, shortly pedicelled, laxy arranged in rigid racemes, 1-2-sexual. Calyx 5-6-lobed. Petals 0. Stamens 10-12. Berry small, 5 mm. diam., shortly stalked, obovoid, attenuated at the base, the apex rounded and obtusely 3-denticulate. Seeds few, pale brown.

Distribution: Sind, Baluchistan.—Persia, Arabia, Syria, Egypt, Nubia, Abyssinia.

In Baluchistan the twigs, leaves and flowers are fried, ground to a powder, mixed with a little neshar and applied dry to wounds and sores to kill maggots, etc. (Hotson).

Baluchistan: Kalirram, Kirmkush.

VIOLACEAE.

Herbs or shrubs. Leaves alternate, entire or pinnatisect; stipules foliaceous or small, commonly deciduous in the shrubby species. Flowers regular or irregular. Sepals 5, usually persistent, equal or

unequal, imbricate in bud. Petals 5, hypogynous, equal or unequal, imbricate or contorted in bud. Stamens 5; filaments shorts, broad; anthers free or connate; connective broad, produced beyond the cells. Ovary sessile, 1-celled; ovules many, on 3 parietal placentas, anatropous; stigma capitate, truncate of cupular, entire or lobed. Fruit, a 3-valved capsule, rarely baccate. Seeds small; albumen fleshy; embryo straight; cotyledons flat.—Genera 21. Species 450.—Almost cosmopolitan.

Corolla irregular. Lower petal dissimilar.
Staminodes absent. Capsule loculicidal.
1. Sepals produced at the base .... VIOLA.
2. Sepals not produced at the base .... IONIDIUM.

The members of this Order are used for their sedative diaphoretic, diuretic, emetic, purgative, and expectorant properties.

Among the products isolated from them may be mentioned:—(1) essential oils; (2) glucosides—iridin, violaquercitrin, violutoside—; (3) a carbohydrate—inulin—; (4) an ester—methyl salicylate—; (5) a mustard oil—phenylethyl—; and (6) colouring matters—luteolin, quercetin.

OFFICIAL:—*Viola maderensis* Lowe=*V. maderensis* Prim. (Portugal); *V. odorata* Linn. (France) var. *vulgaris* De Cand. (Portugal); *V. sudetica* Willd. (France); *V. tricolor* Linn. (Austria, Germany, Switzerland, Turkey) var. *arvensis* De Cand.=*V. tenella* Lewis (Portugal).

VIOLA Tourn. ex Linn.

Herbs, rarely shrubs. Leaves alternate; stipules persistent, often foliaceous. Flowers on 1- (rarely 2-) flowered axillary peduncles, often dimorphic, some large-petalled which ripen few seeds, others small-petalled or apetalous and prolific. Sepals subequal, produced below their insertion at the base. Petals usually spreading, the inner (lower by the torsion of the pedicels) often the larger, spurred or saccate at the base. Anthers connate; the connectives of the two lower often spurred at the base. Style clavate, or variously dilated, sometimes straight with a terminal stigma, or more or less curved with a stigma facing the lower petal. Capsule elasti-

cally 3-valved. Seeds ovoid or globose.—Species 300.—Chiefly N. temperate.

A. Stigma obliquely 2-lobed, not beaked; lobes short, spreading	7. *V. biflora.*
B. Stigma terminal, truncate, dilated, depressed, orbicular or lobed.	
1. Flowers lilac or pale blue	5. *V. patrinii.*
2. Flowers pale purple	4. *V. diffusa.*
C. Stigma very oblique or quite lateral, often minute and perforated	
1. Flowers lilac or pale blue	1. *V. serpens.*
2. Flowers bluish purple or white, more or less scented	2. *V. odorata.*
3. Petals lilac, the lower with a few parallel simple veins, not reaching the margin	8. *V. sylvestris.*
4. Flowers small, white with a violet blotch on the uppermost petal	3. *V. cinerea.*
5. Flowers large, usually about 3 colours represented	6. *V. tricolor.*

The root is slightly emetic; the leaves are considered emollient and laxative; the flowers are used as an emollient, diaphoretic, antispasmodic, and stomachic.

The following species are used medicinally:—in Europe—*V. alba* Bess., *V. alpina* Jacq., *V. arenaria* DC., *V. calcarata* Linn., *V. campestris* Bieb., *V. canina* Linn., *V. cenisia* Linn., *V. collina* Bess., *V. biflora* Linn., *V. hirta* Linn., *V. mirabilis* Linn., *V. odorata* Linn., *V. palustris* Linn., *V. pedata* Linn., *V. pinnata* Linn., *V. sciaphila* Koch., *V. sepincola* Jord., *V. sylvestris* Lam., *V. tricolor* Linn., *V. uliginosa* Bess.—; in China—*V. patrinii* DC.—; in Indo China—*V. diffusa* Ging, *V.* japonica Lang., *V. mirabilis* Linn., V. patrinii DC., *V. pinnata* Linn., *V. sylvestris* Lam., *V. vaginata* Max., *V. verecunda* A. Gray.—; in North America—*V. cucullata* Ait., *V. lanceolata* Linn., *V. palmata* Linn., *V. pedata* Linn.—; in Madeira —*V. madernsis* Prim.—.

The toxic glucoside iridin has been found in *V. canina*, *V. odorata*, *V. sylvestris*, and *V. tricolor*.

OFFICIAL:—Flowers of *V. odorata* Linn., *V. sudetica* Willd (France); flowered plant of *V. tricolor* Linn. (Austria, Germany, Switzerland, Turkey),—var. *arvensis* De Cand.=*V. tenella* Lewis (Portugal); leaves and petals of *V. maderensis* Lowe=*V. maderensis* Prim., *V. odorata* Linn. var. *vulgaris* De Cand. (Portugal).

1. **Viola serpens** Wall. in Roxb. Fl. Ind. Ed. Carey II, 449. —PLATE 79.

Stoloniferous glabrous (or hirsute). Stems long, leafy. Leaves ovate-cordate blunt or acute, crenate-serrate, 3.8-6 cm. long, 18-3.3 cm. wide, hairy beneath. Stipules toothed. Sepals acute 5 mm. long. Corolla pale lavender, lower petals streaked darker violet purple, rarely all white, 12 mm. long, spur short, rounded. Petals blunt. Capsule 10 mm. long; valves blunt.

Distribution: Hilly districts throughout India, Ceylon, Burma and Malay Peninsula.—Java, Sumatra, China.

This species also yields *Banafsha* of the bazaars, and is considered to have medicinal properties similar to those of *V. odorata.* In the Punjab, a medicinal oil, called *raughan-i-banafsha,* is prepared from it.

Hindi: Banafsha, Thungtu—; *Kumaon:* Thungtu—; *Punjab:* Banafsha—.

2. **Viola odorata** Linn. Sp. Pl. (1753) 458.—Plate 80B.

Perennial stock short, but sometimes branched, knotted with the remains of the old leaf-stalks and stipules, and usually emitting creeping runners or scions. Leaves in radical (or rather terminal) tufts, broadly cordate, rounded at the top, and crenate, downy or shortly hairy, with rather long stalks. Stipules narrow-lanceolate or linear, and entire. Peduncles about as long as the leaf-stalks, with a pair of small bracts about half way up. Flowers nodding, of the bluish purple colour named after them, or white, more or less scented. Sepals obtuse. Spur of the lower petal short. Stigma pointed, horizontal or turned downwards.

Distribution: Kashmir, 5,000—6,000 ft.; planted in many hill-stations.—N. & W. Asia, N. Africa, Europe.

The plant is bitter and pungent; hot, antiperiodic; cures malarial fevers, bronchitis, asthma, and "tridosha" (Ayurveda).

The root is purgative; good febrifuge, tonic, expectorant, diuretic; alleviates thirst; removes inflammation; loses its properties on continued boiling.—. The oil removes abdominal pain, relieves cough; acts as an hypnotic and sedative to the brain (Yunani).

The root is a powerful emetic, and is frequently used to adulterate ipecac. A dose of from forty to fifty grains of the powdered roots acts powerfully.

The flowers are emollient and demulcent.

A syrup is made from the petals which is a favourite household remedy for infantile disorders. In France syrup of violets is a medicine for cough and hoarseness. In England violets are cultivated largely at Stratford-on-Avon for the purpose of making the syrup, which when mixed with almond oil is a capital laxative for children, and will help to soothe irritative coughs, or to relieve a sore throat.

The flowers were used in olden times as remedies in many disorders, and were supposed to be especially serviceable to the eyes and in ague.

O'Shaughnessy experimented with the dry plant as a substitute for Ipecacuanha, but without success.

Moodeen Sheriff considers it antipyretic and diaphoretic, and very useful in relieving febrile symptoms and excitement in all forms of fever, particularly in combination with other drugs of the same class.

This is the " banafshah " of the hakims who value it as a strong febrifuge in acute and chronic fevers when given in combination with other drugs. Mohideen Sheriff in his Materia Medica of Madras gives the ingredients of a compound decoction which he found useful in relieving pyrexia of obstinate and long standing cases of typhoid fever, after European medicines, generally used, had failed. The same decoction was administered to a case of chronic fever without any benefit at all. In the out-patients a simple infusion of viola odorata was given to several cases of pyrexia and intermittent fevers without benefit (Koman).

Arabic: Banafsaj, Banafshaj, Behussej, Benephig—; *Armenian:* Manischar—; *Bengal:* Banafsha, Banosa—; *Bombay:* Banafshah—; *Calabria:* Rovesciole—; *Catalan:* Viola, Viola de Bosch, Viola d'olo, Viola vera—; *Czech:* Fialke—; *Danish:* Martsfioler—; *Deccan:* Banafsha—; *Dutch:* Tamme viol—; *English:* Appel-leaf, Bairnwort, Banwort Bessy Banwood, Blaver, Blue Violet, March Violet, English Violet, Fine-leaf, Sweet Violet, Vilip, Violet—; *French:* Fleur de Mars, Jacée de printemps, Violett, Violette cultivée, Violette de mars, Violette odorante, Violette des quatre saisons, Violier commun, Violier

de Mars—; *Genoa:* Viuleta, Viuretta—; *German:* Blauoesken, Blauvoegsche, Blauvoelken, Maertzveilchen, Veilotenblau, Veielotenkraut, Veilchen, Viole, Wohlriechende Veilchen—; *Greek:* Ion—; *Gujerati:* Banaphsa—; *Hindi:* Banafshah—; *Hungarian:* Ibolya—; *Italian:* Mammola, Mammoletta, Viola, Viola Mammola, Viola Marzia, Viola zoppa, Violetta—; *Languedoc:* Memog, Memoi—; *Lombardy:* Zoppina—; *Marathi:* Bagabanosa—; *Persian:* Banafshah—; *Polish:* Skopek—; *Portuguese:* Viola, Viola roxa, Violeta—; *Roumanian:* Micsunea, Tamaioasa, Toporas—; *Russian:* Packutchaya fialka—; *San Remo:* Viureta—; *Sanskrit:* Jvarapaha, Nilapushpa, Sukshmapatra, Vanapsa—; *Sardinia:* Violedda, Viuletta—; *Spanish:* Violeta, Violeta de olor—; *Swedish:* Aekta fioler—; *Tuscany:* Mammoletta, Mammolina, Viola maura, Viola mammola—; *Urdu:* Banafshah—; *Verona:* Fior de San Bastian—.

3. **Viola cinerea** Boiss. Fl. Or. I (1867) 454, var. *Stocksii* (Boiss.) W. Bckr.—*V. Stocksii* Boiss. l. c. 453.—PLATE 80A.

A low much-branched herb, 7.5-15 cm. high, with woody base; branches glabrous. Leaves (including the petioles) 12-25 by 6-12 mm., oblong-obovate, or elliptic-lanceolate, acute, apiculate, decurrent into the petiole, glabrous, entire or obscurely crenulate (rarely dentate); stipules fimbriate. Flowers small, 6 mm. diam., white with a violet blotch on the uppermost petal; pedicles 2-4 cm. long, slender, glabrous, bracts 4.5 mm. long, subulate, attached near the top of the pedicels. Sepals 4.5 mm. long, lanceolate, tapering to a fine point, glabrous, spur very short, rounded. Style clavate, compressed; stigma of 2 oblong, parallel disks. Capsules 5-6 mm. long, smooth, cylindric, pointed at both ends. Seeds ovoid, pointed, white, polished.

Distribution: Sind, Baluchistan, Waziristan, Punjab, W. Rajputana, Kathiawar.—Afghanistan, Persia, Arabia.

This plant is used medicinally in Sind, in the same way as *V. odorata.*

Porebunder: Jinkobanafsha—; *Punjab:* Banafsha—; *Sind:* Banafsha.—.

4. **Viola diffusa** Ging. in DC. Prod. I, 298.

A perennial herb, softly hairy, stemless, stoloniferous. Leaves

tufted, 2.5-1.3 cm., elliptic-ovate, obtuse, crenate, base cuneate rarely cordate, pale green; petiole broadly winged, rarely equalling the blade; stipules free, narrow, toothed; stolons short, sometimes floriferous. Flowers pale purple, sepals subacute, spur globose, style slender, narrowed downwards from the 2-lobed margined obscurely beaked stigma.

Distribution: Subtropical Himalaya from Nepal to Mishmi, 3,000—5,000 ft., Khasia Hills.—China.

In Indo China the flowers are given in diseases of the chest as a pectoral and bechic.

Annam: Dia dinh.

5. **Viola patrinii** Ging. in DC. Prod. I, 293.

Glabrous or pubescent. Stems very short or none. Leaves tufted, triangular, usually narrowly elongate, 3.8-6.3 by 1.3-3.8 cm., base cordate or truncate, margins crenate; upper part of stalk usually winged; stipules entire or nearly so, adnate for more that half their length. Flowers usually dark lilac, often scented, stalks sometimes 15 cm. long. Stigma 3-lobed, hollowed at the top.

Distribution: Temperate Himalaya.—China, Japan.

In China, Indo China, and Malaya the flowers are said to purify the blood and the plant is used as a pot-herb. The plants are also bruised and applied to ulcers and foul sores.

Annam: Tu hoa dia dinh—; *Chinese:* Tzu Hua Ti Ting—.

6. **Viola tricolor** Linn. Sp. Pl. 935.

Glabrous or nearly so, the stems becoming long and branched. Basal leaves cordate or round-cordate, those of the stem becoming ovate-oblong or lanceolate, all stalked and crenate-dentate; stipules large, pinnately parted toward the base. Flowers large, usually about 3 colours represented; spur usually twice as long as the appendages of the calyx.

Distribution: Cultivated in India.—Indigenous in Europe, N. Asia and N. America.

The Wild Violet, or Pansy, is household remedy in many parts of Europe. The plant is taken internally in infusion as a depurative in skin eruptions.

In Spain the plant is considered to be stimulant and is used in rheumatism and in skin diseases.

The leaves were once esteemed in the cure of cutaneous disorders, and they are still employed in Italy in *tinea capitis*.

The root is said to have similar properties to those of Ipecacuanha, and is often used beneficially as a substitute by country doctors in England. An infusion thereof is admirable for the dysentery of young children.

Catalan: Pensaments, Trinitaria—; *Dutch:* Driekleurig viooltje—; *English:* Cuddle-me-to-you, Flame Flower, Flamy, Garden-gate, Gentleman John, Heartsease, John-of-my-Pink, Jump-up-and-kiss-me, Kiss-her-í-th'-buttery, Love-in-idleness, Meet-her-í-th'-entry, Pance, Pansy, Pansy Violet, Paunce, Tittle-my-fancy, Wild Pansy, Wild Violet—; *French:* Clavelée, Fleur de la Trinité, Herbe à la chevale, Herbe clavelée, Herbe ă la clavelée, Herbe de la Trinité, Jacée tricolore, Pensée, sauvage, Petite jacée, Violette tricolore—; *German:* Abnehmkraut, Ackerveilchen, Blauoesken, Denkanmich, Denkbluemchen, Dreifaltigkeit, Dreifaltigkeitskraut, Faulschken, Fioelken, Freisamkraut, Fresern, Gedenkemein, gengelkraut, Hundsveilchen, Maukraut, Schwiegerle, Schwiegermuetterchen, Stiefmuetterchen, Tagundnachtblume, Tausendschoen, Unnuetzesorgen, Dreifarbiges Veilchen, Veilchenkraut, Wergehundkommni-chtwieder, Vergissmeinnicht—; *Hungarian :* Arvacska—; *Italian:* Penserio, Viola tricolore—; *Languedoc:* Pensado—; *Malta:* Pansy, Viola di tre colori, Pensieri—; *Portuguese:* Amor perfeito, Herva seraphica, Violeta tricolor—; *Spanish:* Pensamientos, Trinitaria—; *Roumanian:* Catifeluta—; *Russian:* Anyutini glazki—; *Turkish:* Hercai menekse—.

7. **Viola biflora** Linn. Sp. Pl. 936.

Glabrous or pubescent. Stems usually erect, 7.5-25 cm. Leaves 2 or 3, kidney-shaped, 2-2.5 cm. across, crenate; stipules ovate or oblong. Flowers 1 or 2 on the same stalk; pale yellow, the lower petal streaked with black; spur very short; stigma 2-lobed.

Distribution: Temperate Himalaya.—N. temperate regions.

This violet is much used medicinally in Spain. The root is given as an emetic; the flowers as an emollient, pectoral, diaphoretic, and antispasmodic; the leaves as an emollient and laxative.

8. **Viola sylvestris** Lam. Fl. Fr. II, 680—*V. sylvatica* Fries.

Habit diffuse; height 5-15 cm.; stem short without a true sobole. Leaves prolonged, heart-shaped, dark green. Flowers small, pale violet, with a long spur flattened, slender, entire, darker than the petals, not furrowed. Petals oblong, lilac, narrow, the lower with few parallel nearly simple veins not reaching the margin. Calyx-segments small, indistinct, hardly produced in fruit. Anther spurs lance-shaped, narrow. Flowering branches in the axils, with a central rosette of leaves. Stigma hooked, with a horizontal beak. Fruit-stalks erect.

Distribution: Kashmir and Kishtwar, 4,000—8,000 ft.—N. Asia and westwards to the Atlantic.

The plant is used in chest troubles as a bechic and pectoral. The stems, leaves, and flowers are bruised and applied to wounds and foul sores.

English: Pale Wood Violet, Wood Violet—.

Ionidium Vent.

Herbs or undershrubs. Leaves alternate, rarely opposite. Flowers axillary, orange or purple. Sepals 5, subequal, not produced at the base. Petals 5, the lower larger, clawed, saccate or spurred at the base. Anthers connate or free, 2 or 4 of them gibbous or spurred at the back. Style clavate, incurved; stigma oblique. Capsule elastically 3-valved. Seeds globose; testa crustaceous.—Species 50.—Tropical and subtropical regions.

The root is diaphoretic, diuretic, and in large doses emetic and cathartic.

The following species are used medicinally in China—*I. heterophyllum* Vent.—; in South America—*I. brevicaule* Mart., *I. circaeoides* H. B. & K., *I glutinosum* Vent., *I. Ipecacuanha* Vent., *I. oppositifolium* Roem. & Schult., *I. poaya* St. Hil., *I. polygalaefolium* Vent., *I. strictum* Vent.—.

1. **Ionidium enneaspermum** Vent. Jard. Malm. (1803) fol. 27.—*I. suffruticosum* Ging in DC. Prodr. I. 311.—*I. heterophyllum* Vent. l. c.—Plate 81 (under *I. suffruticosum* Ging.).

A small suffrutescent perennial herb, 15-30 cm. high, with many diffuse or ascending branches, glabrous or more or less pubescent. Leaves linear or lanceolate, 4-5 cm. by 3-8 mm., subsessile, entire, or with serrated margins; stipules gland-tipped, subulate. Flowers red, axillary, solitary; pedicels shorter than the leaves, 6-12 mm. long, erect, slender; bracts small, above the middle of the pedicel. Sepals 2.5 mm. long, lanceolate, very acute, keeled. Petals unequal, the 2 upper ones oblong, slightly longer than the sepals, the 2 lateral longer, falcate, the lowest much larger than the others, having an orbicular or obovate limb with a long claw which is curved behind into a short spur. Capsules about 6 mm. diam., subglobose. Seeds ovoid, acute, longitudinally striate, yellowish white, about 1.5 mm. long.

Distribution: Bundelkhand, Agra, Bengal, almost throughout the Madras Presidency, Gujerat, Khandesh, Carnatic, Ceylon.—Tropical Asia, Africa and Australia.

The plant is bitter and acrid; easily digested; removes "kapha" and "pitta," urinary calculi, strangury, pain, dysentery, vomiting, burning, wandering of the mind, urethral discharges, blood troubles, asthma, epileptic fits; cures cough; gives tone to the breasts; alexeteric (Ayurveda).

The Santals employ the root in bowel complaints of children (Campbell).

The leaves and tender stalks are demulcent, and are used in decoction and as an electuary; they are also employed in conjunction with some mild oil in preparing a cooling liniment for the head.

The fruit in combination with other drugs has been recommended as an antidote to snake and scorpion venoms (Charaka); but it is not an antidote to snake venom (Mhaskar and Caius) and is useless in the treatment of scorpion sting (Caius and Mhaskar).

Bengal: Nunbora—; *Bombay:* Ratanpuras—; *Deccan:* Ratanpuras—; *Hindi:* Ratanpurus—; *Malayalam:* Orelatamara—; *Sanskrit:* Amburuha, Atichara, Avyatha, Charati, Chariti, Lakshmishreshta, Padma, Padmacharini, Padmavati, Padmavha Pushkaranadi, Pushkarini, Ramya, Sarada, Sthalapadmini, Sthalaruha, Sugandhamula, Supushkara—; *Santal:* Birsurajmukhi, Tandisol—; *Tamil:* Orilaitamarai—; *Telugu:* Nilakobari, Purusharatnam, Suriyakanti—.

COCHLOSPERMACEAE.

Trees, shrubs or rhizomatous undershrubs with coloured juice. Leaves alternate, palmatilobed, stipulate. Flowers hermaphrodite, showy, paniculate or racemose. Sepals 5, imbricate, deciduous. Petals 5, imbricate or subcontorted. Stamens numerous; filaments free, equal, or some longer than others; anthers 2-celled, linear, opening by terminal short, often confluent, pore-like slits; ovary 1-celled with parietal placentas projecting into the cell, or perfectly 3-celled; ovules numerous; style simple with minutely denticulate stigma. Fruit a 3-5-valved capsule. Seeds glabrous or covered with woolly hairs, straight or cochleate-reniform; endosperm copious, embryo conforming to the shape of the seed, large; cotyledons broad. —Genera 3. Species 18.—Tropics.

Medicinally the Order is of no consequence.

Cochlospermum Kunth.

Trees or shrubs, with yellow or red juice. Leaves palmately or digitately divided. Flowers hermaphrodite, large, yellow, handsome. Sepals 5, imbricate, deciduous. Petals 5, large, contorted in bud. Stamens many, inserted on an eglandular disk; anthers oblong or linear, sometimes apiculate beyond the cells. Ovary globose; ovules many, on 3-5 parietal placentas; style simple; stigma minutely denticulate. Capsule 3-5-valved, incompletely 3-5-celled. Seeds cochleate; testa hard, woolly; embryo curved; cotyledons ovate.—Species 12.—Tropics.

The root and stem are said to be emmenagogue.

C. tinctorium Perr. ex A. Rich. is used medicinally in Gambia and Guinea, *C. insigne* St. Hil. in Brazil.

1. **Cochlospermum gossypium** DC. Prodr. I (1824) 527; Talbot For. Fl. Bomb. I, 70, fig. 45.—*Bombax gossypium* Linn. Syst. ed. 12, II, 457; Roxb. Fl. Ind. III, 169.—Plate 82.

A small tree, 2.4-5.4 m. high, with a branching head; bark smooth, ash-coloured. Leaves scattered about the ends of the branchlets, 7.5-18 cm. diam., palmately 3-5-lobed, glabrous above, white-tomentose beneath; lobes entire, acute; petioles 10-18 cm. long, pubescent when young. Flowers 10-12.5 cm. diam., in terminal

subcorymbose panicles, bright yellow, appearing before the leaves; pedicels stout, 5-12.5 cm. long, grooved and twisted, pubescent. Sepals unequal, oblong, concave, silky outside. Petals obovate, deeply emarginate. Capsules 5-7.5 cm. long, obovoid, striate outside. Seeds 6 mm. long, cochleate, covered with an abundance of white silky wool.

Distribution: Garhwal, Bundelkhand, Bihar, Orissa, Bengal, Burma, Central India, Deccan, W. Peninsula, Madras Presidency in dry forests, especially on stony hills, in all districts, but less common on the W. Coast.

The gum is sweetish; cooling and sedative; stomachic; good in gonorrhœa, syphilis, asthma, eye troubles and trachoma; softens the skin (Yunani).

The gum is used in coughs, and also in gonorrhœa. In Punjab the dried leaves and flowers are given as stimulants.

The gum has been much studied. It is characterised by giving off acetic acid, recognised by smell on opening a bottle containing the gum. This gum also absorbs large quantities of water with consequent swelling. No enzyme could be found in it (Fowler and Malandkar).

Arabic: Katira—; *Bhil:* Ganeri—; *Canarese:* Arasinaburaga, Bettatavare, Buruga, Gagili, Kaduburaga—; *Chota Nagpur:* Sisibaha, Udal—; *Gond:* Gangam, Ganiar—; *Gujerat:* Kadachogund—; *Hasada:* Hupudaru—; *Hindi:* Gabdi, Galgal, Gangal, Ganiar, Gejra, Kumbi—; *Kolami:* Golgal, Hupu—; *Lambadi:* Hoghara—; *Malayalam:* Appakutakka, Chempanni, Chimappanni, Panninara, Parapanni—; *Marathi:* Galgal, Ganeri, Ganglay, Gongal, Gulgul, Gunglay, Kathalyagonda—; *Naguri:* Galgaldaru—; *North-Western Provinces:* Gajra, Kumbi—; *Persian:* Gone, Katira-i-Hindi—; Kokamara—; *Punjab:* Kumbi—; *Saharampur:* Gejra—; *Santal:* Hopo—; *Saora:* Onkur—; *Sinhalese:* Elaimbul, Kinihiriya—; *Tamil:* Kannigaram, Kattilavu, Kattolaga, Kattupanju, Kattuparutti, Kongilam, Kongu, Kumarai, Malaiparutti, Manjardanakku, Nalal, Pachaigiluvai, Palini, Panjittanakku, Pinar, Sudinar, Tanakku, Turumarbalam—; *Telugu:* Adaviburaga, Akshotamu, Buraga, Gungu, Kondagogu, Kongu, Parijatamu, Pratti—; *Urdu:* Katira—; *Uriya:* Beniyamrydami, Konokopolaso, Kontopolas, Pobosokoniari—.

BIXACEAE.

Shrubs or small trees with coloured juice. Leaves alternate, simple, palminerved, stipulate. Flowers hermaphrodite, medium-sized, showy, paniculate. Sepals 5, imbricate, deciduous. Petals 5, large, imbricate, without a scale at the base. Disk none. Stamens numerous, hypogynous; filaments free; anthers horseshoe-shaped, opening by short slits at the top. Ovary superior, 1-celled, with 2 parietal placentas; ovules numerous; style slender, recurved in bud; stigma 2-lobed. Fruit a densely echinate-setose or smooth capsule, 2-valved, valves thick with the placentas in the middle; seeds obovoid; testa rather fleshy, red; endosperm copious; embryo large; cotyledons broad, incurved at the apex.—Genera 3. Species 6.—Tropics.

Medicinally the Order is unimportant.

Such colouring matters as bixin and orellin have been isolated from *Bixa orellana* Linn.

Bixa Linn.

A shrub or small tree. Leaves simple; stipules minute. Flowers in terminal panicles, bisexual. Sepals 5, imbricate, deciduous. Petals 5, contorted in bud. Anthers opening by 2 terminal pores. Ovary 1-celled; style slender, curved; ovules numerous, on 2 parietal placentas. Capsule loculicidally 2-valved. Seeds many, testa red and pulpy; albumen fleshy; embryo large; cotyledons flat.—Species 2.—Tropical America.

B. orellana Linn. is used medicinally in Indo China, the Philippine Islands, Brazil, and Guiana.

1. **Bixa orellana** Linn. Sp. Pl. (1753) 512; Wight Ill. t. 17. —Plate 83.

A small evergreen tree. Leaves 10-20 by 6.3-12.5 cm., ovate, acute or acuminate, truncate or subcordate at the base, glabrous on both surfaces; petioles 5-7.5 cm. long. Flowers 5 cm. diam., in terminal panicles; pedicels pubescent. Sepals: The two smaller concave; the three larger oblong or suborbicular. Petals white or pink, obovate. Capsules ovoid or subglobose, clothed with long soft prickles. Seeds trigonous, rounded and grooved on the back, covered with a red pulp.

Distribution: Largely cultivated throughout India.—Indigenous in tropical America.

The plant is bitter and sharply acrid; alexipharmac; cures "kapha" and "vata," headache, leprosy, blood diseases, biliousness, vomiting; allays thirst (Ayurveda).

Astringent and slightly purgative, also a good remedy for dysentery and kidney diseases.

The root-bark is antiperiodic and antiypretic, of great use in uncomplicated intermittent, remittent, and continued fevers.

The seeds are cordial, astringent, and febrifuge, and a very good remedy for gonorrhœa. They possess the antiperiodic and antipyretic properties of the root-bark, but to a smaller extent.

The leaves are a popular febrifuge in Cambodia.

The pulp (a well-known colouring matter) surrounding the seeds is astringent. The seed pulp is used by the American Indians to paint their body all over for full dress, and this use of it is said also to prevent mosquito bites.

In French Guiana the leaves are considered detergent; an infusion is prescribed as a purgative in dysentery.

The root in combination with other drugs has been recommended for internal use in snake bite (Bapat); but it is not an antidote to snake venom (Mhaskar and Caius).

Antsianaka: Vahinamalona—; *Assam:* Jarat, Jolandhar—; *Bengal:* Latkan, Latkhan, Watkana—; *Bombay:* Japhar, Kesari, Kesuri, Kisri, Sendri, Shendri—; *Brazil:* Urucu—; *Burma:* Thideng, Thidin—; *Cambodia:* Chompuh chralok—; *Canarese:* Arnattu, Kesari, Bangarakayi, Japhredu, Rangamalar, Sannajabbale—; *Chittagong:* Powasi—; *Deccan:* Shalkepandu—; *English:* Annatto, Arnatto, Roucou—; *French:* Achiote, Achit, Achote, Ananaie, Anate, Atole, Bichet, Cochehue, Rocouyer, Roucouyer—; *French Guiana:* Rocou, Roucou—; *Galibi:* Ururu—; *Guarana:* Urucuy—; *Gujarat:* Sinduri—; *Hindi:* Latkan, Latkhan, Vatkana—; *Hova:* Sahy—; *Indo China:* Cham pou, Dieu nhuom, Som hou, Som phu, Xiem phung—; *Konkani:* Kesri—; *Lambadi:* Japrero—; *La Reunion:* Rocou, Roucou—; *Madras:* Jabaramaram—; *Malayalam:* Kuppamannal, Kurannamannal—; *Manipur:* Reipom—; *Marathi:* Kesari, Kesuri, Kisri, Sendri Shendri—; *Mexico:* Achiotillo, Achiotl, Bija—;

Philippines: Achiote, Achuete, Anate, Atola—; *Portuguese:* Arnotto—; *Sanskrit:* Karachchada, Raktabija, Raktapushpa, Shonapushpi, Sinduri, Sindurpushpi, Sunomala, Trivapushpi, Virpushpa—; *Santal:* Kougkuombi—; *Sinhalese:* Caha—; *Tagalog:* Achuete, Achute, Atsuiti—; *Tamil:* Amudadaram, Avam, Kungumam, Manjitti, Sappiravirai, Uragumanjal, Vennaivirai—; *Telugu:* Jabura—; *Tupin:* Urucu uva—; *Twi:* Brorfo agyama—; *Uriya:* Gulbas, Guliabha, Japhoran, Lotkons—.

FLACOURTIACEAE.

Trees or shrubs. Leaves simple, alternate; stipules often soon falling off. Flowers hermaphrodite or unisexual, often dioecious or polygamous, variously arranged. Sepals sometimes not distinguishable from the petals, imbricate or open in bud. Petals sometimes not arranged regularly in relation to the sepals, large, small or absent, with or without an opposite scale inside the base, imbricate. Stamens numerous, rarely few, hypogynous, free; anthers 2-celled, often short, opening lengthwise by slits. Ovary 1-celled with 1 or more parietal placentas or rarely the placentas meeting in the middle; ovules 2 or more on each placenta; styles or stigmas as many as the placentas. Fruit indehiscent, mostly a berry or drupe, very rarely a capsule, sometimes large. Seeds with fleshy endosperm and medium-sized embryo; cotyledons often broad.—Genera 70. Species 500.—Tropical and subtropical regions.

A. Petals small, imbricate or absent. Anthers short, bursting by slits.
   Ovary 2-8-celled .... FLACOURTIA.
B. Flowers dioecious. Petals with an adnate scale or basal appendage.
   1. Sepals connate. Stamens very many .... GYNOCARDIA.
   2. Sepals free. Stamens 5-8 .... HYDNOCARPUS.
   3. Sepals four. Petals 8. Stamens 24, free .... TARAKTOGENOS.

The seeds of some of the members yield fatty oils which are used with some success in the treatment of leprosy and other skin diseases. Narcotic and anthelmintic properties are also found in this Order.

The following have been isolated:—(1) alcohols—phytosterols—; (2) acids—hydrocyanic, linolic, palmitic, linolenic, isolinolenic, oleic, chaulmoogric, hydnocarpic—; (3) glucosides—gynocardin—; (4) enzymes—gynocardase—.

OFFICIAL:—*Hydnocarpus spp.* (Belgium, Japan, Spain, Sweden, United States); *H. kurzii* Warburg. (Sweden); *H. Wightiana* Blume (Great Britain).

Taraktogenos Kurzii King (Belgium, Holland, Spain, United States).

FLACOURTIA Commers.

Trees or shrubs, often thorny. Leaves toothed or crenate, 3-5-nerved at the base. Flowers small, dioecious, rarely 2-sexual. Sepals 4-5, imbricate. Petals 0. Stamens many; anthers versatile. Styles 2-10, separate, connate or 0; ovules usually in pairs on each placenta. Fruit indehiscent; endocarp hard.—Species 15.—Tropical Asia and Africa.

A. Thorns not bearing flowers and fruit.
  1. Drupe size of a plum, purple when ripe .... 1. *F. cataphracta.*
  2. Drupe size of a pea. Stigmas 5-11 .... 2. *F. ramontchi.*
B. Thorns bearing flowers and fruit .... 3. *F. sepiaria.*

Astringent and stomachic.

The following species are used medicinally in Indo China—*F. cataphracta* Roxb.—; in La Reunion—*F. cataphracta* Roxb., *F. ramantchi* L'Herit.—; in Madagascar—*F. ramontchi* L'Herit., *F. sepiaria* Roxb.—; in the Gold Coast—*F. flavescens* Willd.—.

1. **Flacourtia cataphracta** Roxb. in Willd. Sp. Pl. IV, 830; Corom. Pl. III, t. 222.—PLATE 84A.

A large evergreen shrub or small tree up to 9 m. high. Stems up to 75 cm. girth, often armed low down with stout compound spines up to 12.5 cm. long. Bark fairly smooth, pale brown. Blaze 5 mm., pale yellow freckled with yellowish brown, darkening on exposure. Leaves 5-10 by 2.3-3.8 cm. oblong or ovate, accuminate, crenate-serrate, glabrous, dark green above and shining on both surfaces. Petiole 2.5-5 mm. long, minutely pubescent. Flowers 2.5-3.8 mm. diam., in glabrous few-flowered racemes 7.5-25 mm. long. Fruit 18-23 mm. long, obovoid, green turning brownish purple when ripe.

Distribution: Kumaon, Orissa, Lower Bengal, Assam, Chittagong, Malay Peninsula. —Malay Archipelago.

The fruit is sweetish at first and then sour; stomachic, alexipharmac; helps digestion and allays thirst; useful in biliousness; dispels "tridosha" and other fevers; removes "vata" (Ayurveda).

Leaves and bark slightly acid and acrid; good in diarrhœa, piles, weakness of limbs, bleeding gums, toothache, stomatitis; checks purging (Yunani).

The fruit is recommended as useful in bilious conditions and, like most acid fruits, it no doubt relieves the nausea and checks the purging.

The leaves and young shoots taste like rhubarb, and are supposed to possess astringent and stomachic properties, and are prescribed in diarrhœa and weakness.

The leaves are said to have diaphoretic properties.

In Lakhimpur, a decoction of the bark is used for biliousness (Carter); and in La Reunion it is given as an astringent and diuretic.

Arabic: Talisfir, Zarnab—; *Bengal:* Paniala—; *Bombay:* Jaggam, Jangama, Tambath—; *Burma:* Naydwed, Naywe—; *Canarese:* Chankali, Goraji, Kirinelli, Talisapatri—; *Dehra Dun:* Jamnua, Pachnala—; *French:* Prunier d'Inde—; *Gujarat:* Talispatra—; *Hindi:* Paniala, Paniamalak, Paniaunvola, Talispatri—; *Indo China:* Bo quan, Mu cuon, Mung quan—; *Kadir:* Saralanka—; *Konkani:* Jagomi—; *La Reunion:* Prune malgache—; *Malayalam:* Kanji, Talisam, Vayukattan—; *Marathi:* Tambat—; *Persian:* Talispatar—; *Portuguese:* Mamonga—; *Sanskrit:* Ahini, Kalameshi, Khadiraparni, Paniyamalaka, Prachinamalaka, Talishapatra, Varibadaram, Vidara—; *Saora:* Kuski, Kusus, Mullumanu—; *Sinhalese:* Ratangwassa—; *Tagalog:* Bitanhol—; *Tamil:* Saralu, Talisam, Talisapatri, Vayangarai—; *Telugu:* Kuragayi, Talisapatramu—; *Tulu:* Koraji—; *Urdu:* Tulispatar—; *Uriya:* Panionla—.

2. **Flacourtia ramontchi** L'Herit. Stirp. (1784) 59, tt. 30. 30B; Wight Ic. t. 85; Cooke Fl. Bomb. Pres. I, 55 (partim).—*F. sapida* Roxb. Corom. Pl. I, t. 69.—Plate 84B.

A shrub or small tree, deciduous, armed with axillary thorns, and often with tufts of branched thorns on the stem. Leaves variable,

2-9 cm. by 2-5 cm., ovate, broadly elliptic, obovate or suborbicular, crenate or serrate, apex acute or acuminate or rounded, glabrous or pubescent above, more or less pubescent beneath; petiole 5-8 mm. long. Flowers greenish yellow, dioecious, in short simple or branched usually tomentose racemes. Sepals 4-5, about 2 mm. long, ovate or orbicular, hispid and cilliate, imbricate. Petals 0. Stamens numerous; anthers small, versatile, opening by slits. Ovary on a glandular disk; stigmas 5-11, free or connate. Fruit 8-12 mm. diam., globose, red or dark brown or dark purple; endocarp hard with as many cells as seeds. Seeds 8-16.

Distribution: Sub-Himalayan tract and Outer Himalaya, ascending to 4,000 ft. from the Indus eastwards and in the adjacent plains, Upper Gangetic Plain, common in the Peninsula, W. Ghats, forests of the N. Circars and Deccan up to 3,000 ft. Burma in indaing and in dry forests.

The fruits are sweet, appetising and digestive. They are given in jaundice and enlarged spleen.

After child-birth among natives in the Deccan, the seeds are ground to powder with turmeric, and rubbed all over the mother's body to prevent rheumatic pains from exposure to damp winds.

The gum is given along with other ingredients for cholera.

The bark is applied to the body along with that of *Albizzia,* at intervals of a day or so during intermittent fever, in Chota Nagpur (Campbell). The Species of *Albizzia* is not mentioned (K.R.K.)

In La Reunion the bark is used as an astringent and diuretic.

In Madagascar the fruit is considered diuretic; the root is prescribed in nephritic colic.

Almora: Kanel—; *Bauswara:* Kanker—; *Bengal:* Binja, Katai, Tambat—; *Betsimisaraka:* Valamoly, Voatronaka—; *Bombay:* Bhekal, Kaikun, Kakad, Kantaka, Pahar, Swadu, Tambat—; *Burma:* Nayuwai—; *Canarese:* Gajabira, Gajale, Hettarimullu, Hunmunki, Muldindu, Mullutari, Nayibela—; *Central Provinces:* Bilati, Kakein, Kank, Kanki—; *Ceylon:* Katukali—; *Coorg:* Gapra, Gupra—; *Deccan:* Kanbowchi, Swadu—; *Dehra Dun:* Kanego—; *Gond:* Armasuri, Katien—; *Gujarat:* Kankod—; *Hindi:* Bhanber, Bilangra, Bowchi, Bunj, Handi, Kakein, Kandai, Kandei, Kanju, Katar, Kukar, Kundayi—; *Khond:* Sapka—; *Kolami:* Mehrlo, Merlee, Sarlarka, Serali—; *Kumaon:* Bilangra, Bilangur—; *Kurku:* Gurgoti—;

Lambadi: Lotpatar—; *La Reunion:* Prune malgache marronne—; *Madagascar:* Lamoty—; *Marathi:* Bhekal, Kaker, Paker, Tambat—; *Mhairwara:* Kaikun—; *Palamow:* Katail—; *Punjab:* Kakoa, Kandei, Kangu, Kukai, Kukoa—; *Sanskrit:* Swadukantaka—; *Santal:* Merlee—; *Saora:* Bejjuven—; *Seychelles:* Prunier—; *Sind:* Bavache, Bhutankas—; *Sinhalese:* Ugurassa, Uguressa—; *Tamil:* Malukkarai, Sottaikala—; *Telugu:* Bontakandregu, Kanaregu, Kandregu, Nakkanaregu, Nakkaneredu, Nelli, Peddakanaregu, Putikatada—; *Uriya:* Boniso, Potnaboniso—.

3. **Flacourtia sepiaria** Roxb. Corom. Pl. I (1795) 48, t. 68. —*F. obcordata* Roxb. Fl. Ind. III, 835.—Rheede Hort. Mal. V, t. 39.—Plate 85.

A very thorny small rigid bush; thorns straight, sharp, up to 5 cm. long, sometimes branched, many of them bearing clusters of leaves and flowers, and longer than the leaves; twigs pubescent. Leaves on the young shoots alternate, on the older fascicled, small, 2-3.5 cm. by 12 mm., very rarely 2.5-7 cm. in luxuriant plants, elliptic, obovate or obcordate, or orbicular, rarely oblong or oblanceolate, cuneate or narrowed at the base or cordate, more or less crenate-serrate except at the base, glabrous, stiff; secondary nerves 3-4, reticulate between; petioles 3-6 mm. long, often pubescent. Flowers dioecious, small, axillary, greenish, solitary at the ends of the short shoots or in racemose clusters shorter than the leaves. Male sepals ovate, obtuse. Female flowers on pedicels up to 5 mm. long, sepals orbicular. Styles 3-7, stigmas bilobed. Berry globular, smooth, reddish, turning dark-coloured when ripe, with about 6-10 mm. diam.; pyrenes angular, rugose; testa smooth. Cotyledons broadly orbicular, base somewhat cordate; radicle excluded, straight.

Distribution: Kumaon, dry jungles throughout Bengal, Bihar, Orissa, Upper Burma, Andamans, the W. Peninsula, scrub forests in all districts of the Madras Presidency, especially on the Coromandel Coast and in the Deccan.

This tree is said to yield an antidote to snake-bite from an infusion of the leaves and roots. The bark triturated in sesamum oil, is used as a liniment in rheumatism.

In Madagascar an infusion of the leaves is given in cases of snake-bite; the bark triturated in oil is used as a liniment in gout; the ashes of the root are considered serviceable in kidney diseases.

Neither the leaves nor the roots are an antidote to snake venom (Mhaskar and Caius).

Bombay: Atruna, Tambat—; *Canarese:* Mirde, Miridi—; *Central Provinces:* Bainch—; *Ceylon:* Mulanninchil—; *Gujerati:* Lodri—; *Hindi:* Kondai, Kondari—; *Malayalam:* Kurumuli—; *Marathi:* Atran, Tambat—; *Porebunoler:* Lodri—; *Punjab:* Dajkar, Jidkar, Khatai, Kingro, Sherawane, Zargal—; *Sakalave:* Lamoty—; *Tagalog:* Bitongol—; *Tamil:* Kodumundi, Sottaikala—; *Telugu:* Kanaregu, Kandregu, Pulivelaga—; *Uriya:* Baliboniso, Boniso, Botubo, Kankui—; *Visayan:* Sauasaua—.

GYNOCARDIA R. Br.

Species 1.—India.

1. **Gynocardia odorata** R. Br. in Roxb. Corom. Pl. 95, t. 290.—*Chaulmoogra odorata* Roxb. Fl. Ind. III, 835.—*Chilmoria dodecandra* Ham. in Trans. Linn. Soc. XIII, 500.—PLATE 86.

A moderate-sized evergreen tree; all parts glabrous. Bark about 6 mm. thick, rather smooth, ash-coloured; cut pale coloured, dry; Leaves oblong to elliptically lanceolate, acute at base, on a rather slender, 6-8.5 mm. long petiole, abruptly acuminate, almost coriaceous, glabrous. Flowers pale yellow, almost 3.8 cm. diam., the females larger, fragrant, on 3.8 cm. long peduncles, fascicled, arising from tuberosities from the trunk and larger branches; stamens in males very numerous, with woolly filaments; staminodes in females 10, pinnatified, villous; berries as large as an orange, on a rather slender peduncle 2.5-3.8 cm. long, globular, with a thick, ash-coloured, roughish bark. Seeds numerous, imbedded in pulp.

Distribution: Sikkim, Khasia Hills, Chittagong, Martaban Hills.

The fruit is hot; anthelmintic; useful in bronchitis, ulcers, skin diseases, small tumours and slight inflammations, leprosy, diabetes, gonorrhoea, fever, piles (Ayurveda).

The oil is used in leprosy and other forms of skin diseases.

In Indo China the seeds are considered tonic, but they are used externally only; they are pounded, mixed with oil, and used for skin diseases.

Bengal: Chaulmugra, Chaulmugri, Petarkura—; *Bombay:* Chaulmogra—; *Hindi:* Chaulmogra, Chhalmugra, Choulmungri—;

Indo China: Dai phong tu, Doc chat—; *Lepcha:* Tukkung, Tulkung—; *Magahi:* Tungpung—; *Nepal:* Bandre, Gante, Kadu, Ramphal—; *Persian:* Brinjmogra—; *Sanskrit:* Alasakapaha, Kushthapa, Sagarodbhuta, Tuvaraka—; *Sinhalese:* Taliennoe—.

HYDNOCARPUS Gaertn.

Trees. Leaves alternate, serrate or entire; stipules deciduous. Flowers axillary, solitary or in few-flowered racemes or fascicles, dioecious. Sepals 5, much imbricate in bud. Petals 5 with a scale at the base of each. Male flowers: Stamens 5-8; anthers oblong or reniform; connective broad. Ovary O or rudimentary. Female flowers: Stamens as in the male, but without pollen or reduced to staminodes. Ovary 1-celled; ovules many, on 3-6 parietal placentas; stigmas 3-6, sessile or subsessile, spreading, dilated, lobed. Berry large, subglobose; pericarp woody. Seeds numerous; testa crustaceous; albumen oily; cotyledons foliaceous, broadly ovate, flat.—Species 25.—Indo-Malayan.

1. Flowers 13 mm. diam. .... 2. *H. venenata.*
2. Flowers 2.5 cm. diam. .... 1. *H. wightiana.*
3. Flowers 15 mm. long .... 3. *H. anthelminthica.*

A medicinal oil is extracted from the seeds.

H. anthelmintica Pierre is used in China and Indo China, *H. polyandra* Blanco in the Philippine Islands.

OFFICIAL:—The oil from the seeds of *Hydnocarpus spp.* (Belgium, Japan, Spain, Sweden, United States); *H. Kurzii* Warburg (Sweden); *H. Wightiana* Blume (Great Britain).

1. **Hydnocarpus Wightiana** Blume Rumphia IV (1848) 22. —*H. inebrians* Wall. Cat. 6670 (non Vahl) Wight III. I,t.16.— PLATE 87.

A tree, reaching 12-15 m. in height. Leaves 12.5-23 by 3.8-7.5 cm., ovate, oblong or lanceolate, acuminate, entire or serrate, glabrous, base rounded or acute; petioles 6-9 mm. long; stipules lanceolate, deciduous. Flowers 9-12 mm. diam., solitary or in small racemes. Sepals 5, the outer ovate, the 3 inner much larger, very concave. Petals 5, broadly oblong or orbicular, rounded at the top, fringed with soft white hairs; scales about half the size of the petals, ovate, densely hairy. Male flowers: Stamens 5, opposite the petals; fila-

ments subulate, hairy at the base, about equalling the petals. Female flowers: Stamens 5, as in the male; anthers without pollen. Ovary globose, hairy; stigmas flat on the top of the ovary, each cuneate and 2-lobed. Berry globose or obovoid, size of a small apple, tomentose. Seeds obtusely angular, numerous, yellowish.

Distribution: Endemic in tropical forests along the W. Ghats from the Konkan southwards and below the Ghats in Kanara and Malabar in damp situations, especially near water. Common in Travancore up to 2,000 ft.

The seeds have long been used as a domestic remedy upon the Western Coast, in certain obstinate skin diseases, ophthalmia, and as a dressing for wounds and ulcers. The oil expressed from them is used in scabby eruptions mixed with an equal portion of *Jatropha Curcas* oil, sulphur, camphor and lime-juice. For scald head, equal parts of the oil and lime water are used as a liniment. In the Konkan also, the oil has a reputation as a remedy for *Barsati* in horses.

The fatty oil from the seeds very closely resembles Chaulmoogra oil, both in physical characters and in chemical composition. The acids obtained from the oil consist chiefly of Chaulmoogric acid, and a lower homologue of the same series, *hydnocarpic* acid.

The chemistry of the oil has been studied by Power and Barrowcliff (J. Chem. Soc., 87, 1905), and by Ittyerah and Sudborough (J. Ind. Inst. Sc., 5, 1923).

Bicol: Butungmanoc—; *Bombay:* Kadukavatha, Kauti, Kava, Kowti—; *Canarese:* Bhutahi, Garuduphala, Niradivittulu, Surante—; *Deccan:* Janglibadam—; *Goa:* Kosto—; *Kadir:* Koti, Nirvetti, Vattai, Vetti—; *Konkani:* Konstel, Konxtti—; *Malayalam:* Koti, Maravetti, Maroti, Niralam, Nirvetti, Vetti—; *Marathi:* Kadukavata, Kantel, Kastel, Kowti—; *Sanskrit:* Garudaphala—; *Sinhalese:* Makulu—; *Tamil:* Maravattai, Maravetti, Niradimuttu—; *Telugu:* Adavibadamu, Niradi—; *Tulu:* Surante—.

2. **Hydnocarpus venenata** Gaertn. Fruct. I, 288, t. 60, f. 3.—*H. inebrians* Vahl Symb. III, 100 (non Wall.).

A large tree. Branchlets puberulous or silky. Leaves 12-18 by 2.5-6.5 cm., lanceolate or oblong- or elliptic- lanceolate, obscurely serrate, coriaceous; nerves very oblique; petiole 12 mm. long, stout,

Racemes 2.5 cm. long or less, densely tomentose; buds 4 mm. diam. Flowers 12 mm. diam. Sepals 5, orbicular, subequal, rather shorter than the petals, ciliate, tomentose on the back. Petals 5, orbicular, glabrous, scales villous. Stamens 5, equalling the petals. Fruit the size of a walnut, densely tomentose. Seeds grooved, ridges rough.

Distribution: Ceylon, up to 2,000 ft.

The oil is used as an external application in certain cutaneous diseases, and has a special reputation in leprosy.

The oil from the seeds was administered to twenty cases of leprosy and was found very beneficial in early cases and slightly so in longstanding cases (Koman).

Ceylon: Makal—; *Malayalam:* Niredumuttu—; *Marathi:* Kauti—; *Sinhalese:* Makulu—; *Tamil:* Niridumuttu—; *Telugu:* Niruduvittulu—.

3. **Hydnocarpus anthelminthica** Pierre; Gagnep. in Bull. Soc. Bot. France LV (1908) 523.

A stout tree, 10-20 m. high; stem erect, short; branchlets slender, virgate, sulcate. Leaves 10-30 cm. long, 3-7 cm. broad, coriaceous, entire, rotund-obtuse at the base, attenuate-obtuse at the apex, lurid above, lutescent below; lateral nerves 8-10 pairs, oblique; veins conspicuous, forming a dense net; stipules minute, caducous. Petiole 12-15 mm. long. Inflorescence axillary, with a short peduncle, compound racemes 2-3, few-flowered, unilateral; pedicels filiform, pubescent; flowers polygamous, rose. Sepals 5, ovate-obtuse, imbricate, villous on both sides, connate at the base. Petals 5, 15 mm. long, imbricate-contorted, ovate, linear-obtuse, rose or purple. Scales linear, opposite the petals, united with them at the base, ciliate on the margin, inside villous at the apex. Stamens 5. Filaments thickened at the base, subulate at the apex. Anther extrorse, oblong-obtuse, loculi distinct, with a broad connective, in the female flowers the sterile stamens fleshy fusiform, ovary ovoid or obovoid, unilocular, constricted at the apex into a velvety terete style; stigma 5-radiate, obtuse, scarcely lobed at the apex. Ovules villous or glabrous anatropous ascending, in the male flowers the ovary abortive resembling a hairy terete column. Fruit large, 8 cm. diam., globose umbonate at the apex. Seeds 30-40,

18-15 mm. long, 10-15 mm. broad, irregularly ovate-compressed, rotund at the base and the apex, dirty grey; testa woody, albumen copious, oil-bearing; embryo almost as long as the albumen. Cotyledons membranous ovate, acuminate at the apex, cordate at the base with 3 distinct nerves.

Distribution: Siam.—Indo-China up to 1,000 ft. Cultivated at Singapore.

The oil from the seeds has for ages been employed by the Chinese in the treatment of parasitic pediculi, leprosy, and many skin diseases. The seed is extensively used in Indo China.

In Cambodia the bark is prescribed for incontinence of urine.

Chinese: Feng Yu Tzu, Ta Feng Tzu, Ta Fung Tze—; *Indo China:* Chum bao lon, Dai phong tu, Krabao phle thom—; *Malaya:* Foong yau tze—; *Siamese:* Lukrabao, Maikrabao—.

TARAKTOGENOS Hassk.

Trees with entire alternate leaves. Flowers in axillary cymes, some bisexual, others male only. Males: Sepals 4, in decussate pairs, imbricate, round, concave. Petals 8 in 2 rows, smaller, with a fleshy, cuneate scale, often dentate at the tip to each petal. Stamens 20 to 32; filaments short; anthers cordate. Female flowers: Sepals often 3, petals 6 and stamens 17. Ovary long, ovoid sulcate, with 4 deflexed stigmatic lobes, 1-celled; obules many on 4 parietal placentas. Fruit large, globose or ovoid, with a hard fibrous or woody rind, and several seeds imbedded in pulp. Seeds: Testa hard, albumen copious, cotyledons large, cordate.—Species 12.—Indo-Malayan.

The oil from the seeds of *T. kurzii* King is officinal in Belgium, Great Britain, Holland, Spain, and the United States.

1. **Taraktogenos kurzii** King in Journ. As. Soc. Beng. 59 (1891) 123.—*Hydnocarpus heterophyllus* Kurz For. Fl. Burm. I, 77.—*H. Kurzii* Warbg. ex Craib. Fl. Siam. Enu. pt. I (1925) 97. —PLATE 88.

It is not impossible that there is more than one species, variety, or possibly physiological race under the name *T. kurzii.*

An evergreen tree, 12-15 m. Shoots, young leaves and inflorescence tawny pubescent. Leaves thinly coriaceous, entire, 18-25 cm.,

lanceolate or oblong-lanceolate. Secondary nerves very prominent beneath, tertiary numerous, transverse, and parallel. Sepals 4 petals 8, broadly ovate, ciliate, each with a flat fleshy pubescent gland at the base. Stamens 24, free, filaments hairy. Fruit, size of an orange, tawny-velvety. Seeds numerous, embedded in pulp.

Distribution: Chittagong, Minbu district in Upper Burma, eastern and southern slopes of the Pegu Yoma, Tenasserim, very frequent in Martaban, Assam.

The seeds yield the Chaulmoogra Oil of commerce and medicine.

Assam: Lemtam—; *Burma:* Kalanzo, Kalaw, Kalawaso, Kalawni, Kalawso—; *Lepcha:* Tukakunga—.

PITTOSPORACEAE.

Trees, erect or climbing shrubs. Leaves alternate, rarely opposite or verticillate, entire or rarely toothed. Flowers hermaphrodite. Sepals 5, free or connate, imbricate. Petals 5, hypogynous, free or connate, imbricate. Stamens 5, free; anthers versatile. Ovary 1-celled, or 2-5-celled by the intrusion of as many parietal placentas; style simple; stigma terminal, 2-5-lobed; ovules many, parietal or axile. Fruit capsular or indehiscent.—Genera 10. Species 90.—Confined to Australia (except Pittosporum).

Medicinally the Order is of little interest.

PITTOSPORUM Banks.

Erect shrubs or small trees, usually evergreen, glabrous or rarely tomentose. Leaves entire or sinuate-dentate, subverticillate at the apices of the branches in some species. Sepals free or connate at the base. Petals connivent at the base or beyond the middle into a tube or coherent, rarely spreading from the base. Filaments subulate; anthers erect, 2-celled, bursting by slits. Ovary sessile or shortly stalked, incompletely 2-3-celled; style short. Capsule 1-celled, woody, 2-, rarely 3- valved; valves placentiferous in the middle.

Seeds smooth, usually imbedded in a viscous pulp.—Species 70.—Tropical and subtropical regions of the Old World.

Bitter, aromatic, and narcotic.

The following species are used medicinally in Indo China—*P. tobira* Ait.—; in the Philippine Islands—*P. brachysepalum* Turcz.—; in La Reunion—*P. senacia* Putterl.—; in Southern Africa—*P. viridiflorum* Sims.—.

1. **Pittosporum napaulense** Rehder & E. H. Wils. in Sarg. Pl. Wils. III (1916) 326.—*Senacia napaulensis* DC. Prodr. I (1824) 326.—*Pittosporum floribundum* Wight & Arn. Prodr. (1834) 154. —Plate 89 (under *P. floribundum* Wight & Arn.).

A small tree; bark light coloured, dotted with lighter specks. Leaves thinly coriaceous, 7.5-15 by 3.2-5.5 cm., lanceolate or oblong-lanceolate, acute or acuminate, glabrous and shining above, paler beneath, undulate; petioles 1.2-2 cm. long. Flowers numerous, in much-branched, terminal, compound corymbs; pedicels glabrous or pubescent. Sepals 2.5 mm. long, ovate, acute or obtuse, pubescent outside. Petals yellow, 6-8 mm. long, narrow-oblong. Ovary very hairy in the lower part; ovules about 12; style simple, glabrous; stigma 2-lobed. Capsules pisiform, 6 mm. diam., 2-valved, about 6-seeded. Seeds obtusely angular, smooth, black.

Distribution: Subtropical Himalaya from the Punjab to Sikkim up to 5,000 ft., Ganjam, Konkan, W. Ghats, Nilgiris and southwards, hills of S. Arcot and Salem.

The bark is bitter and aromatic, and is said by the tribes of the Western Ghats to possess narcotic properties. It is used in doses of 5 to 10 grs. as a febrifuge, and in doses of 50 grs., is believed to be a specific for snake poisoning; 5 to 10 grains doses of the dried bark were given with benefit in chronic bronchitis. It is a good expectorant, but in one or two cases in which it was tried in Bombay, it gave rise to dysenteric diarrhœa.

In Tranvancore, half-a-teaspoonful doses are given internally in leprous affections; and the oil, beaten up with the kernels and shells of castor oil seeds, is used as a remedy for itch.

In physiological action, the oil is alterative, tonic, and a local stimulant. It appears also to have a specific effect on certain skin

diseases. It has been recommended for trial as a local application in rheumatism, leprosy, sprains and bruises, sciatica, chest affections and phthisis, and opthalmia. Internally it may be prescribed in doses of from 15 minims to 2 drachms in cases of leprosy, various forms of cutaneous disease, secondary syphilis, and chronic rheumatism. It must, however, be employed with caution, as in certain cases it is said to act as a gastro-intestinal irritant, producing vomiting and purging.

The bark is not an antidote to snake venom (Mhaskar and Caius).

Bombay: Yekadi, Yekdi—; *Canarese:* Tammata—; *Lepcha:* Bongzam, Prongzam—; *Marathi:* Vehkali, Vehyenti, Vikhari, Yekadi—; *Nepal:* Khorsane, Phurke, Tibiloti, Tibilti—; *Saora:* Pida, Rakamuki, Rongosani—; *Tamil:* Nanjundai, Tammata—; *Telugu:* Rakamuki—; *Uriya:* Debosundu—; *Visayan:* Balungcanayan—.

POLYGALACEAE.

Herbs or erect or scandent shrubs, rarely small trees. Leaves alternate (rarely whorled), simple or occasionally reduced to scales or 0, exstipulate. Flowers irregular, hermaphrodite, 3-bracteate. Sepals 5, free, much imbricate in bud, the 2 inner larger, sometimes very large, often petaloid (wing sepals). Petals 5 or 3, hypogynous, distinct, unequal, the inferior usually keel-shaped. Stamens 8, hypogynous; filaments united into a sheath, rarely distinct; anthers opening by terminal pores, rarely by slits. Torus small, rarely expanded into an annular disk. Ovary free, 1-3-celled; ovules 1 or more in each cell, anatropous; style usually curved. Fruit generally a 2-celled, 2-seeded, loculicidal capsule, or indehiscent, or of 3 indehiscent carpels. Seed pendulous, often strophiolate, usually albuminous, often pilose.—Genera 10. Species 700.—Cosmopolitan, except New Zealand, Polynesia and Arctic zone.

All the members are more or less tonic, and expectorant; some are bitter, and emetic; a few are acrid, and poisonous. The bark of genus *Krameria* is very astringent.

Saponins—senegin, polygalic acid—and methyl salicylate are amongst the few compounds isolated; also glucosides—gaultherin, polygalin—.

OFFICIAL:—*Krameria spp.* (Spain): *K. argentea* Martins (France, Great Britain, Spain, United States); *K. Ixina* var. *granatensis* Triana (France); *K. tomentosa* St. Hil. (Spain); *K. triandra* Ruiz & Pavon. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, United States).

Polygala amara Linn.=*P. amarella* Reichenbach (Portugal); *P. amarum* Linn. (Denmark); *P. Senega* Linn. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, United States); *P. tenuifolia* Willd. (Japan); *P. vulgaris* Linn. (Portugal).

POLYGALA (Tourn.) Linn.

Herbs, rarely shrubs. Leaves alternate, rarely opposite or verticillate. Flowers spicate or racemose. Sepals unequal, the 2 inner larger (wings) usually petaloid. Petals 3, united at the base with the staminal sheath, the lower one keeled and generally crested. Stamens 8; filaments united for their lower half into a split sheath; anthers opening by pores. Ovary 2-celled; ovule 1 in each cell, pendulous. Capsule 2-celled, loculicidal, 2-seeded. Seeds pilose or glabrous, almost always strophiolate and albuminous.—Species 475. —Almost cosmopolitan.

Herbs, sometimes woody at the base; calyx persistent, keel crested.
- A. Bracts persistent, at least till the flower expands.
  - 1. Undershrubs; racemes axillary, wings petaloid, membranous, strophiole 2-appendiculate .... 1. *P. crotalarioides.*
  - 2. Wings herbaceous, strophiole in or 3-appendiculate .. 2. *P. chinensis.*
- B. Bracts caducous (before flowering), strophiole 3-appendiculate.

1. Capsule rather broadly winged, glabrous, not ciliate .... 5. *P. sibirica.*
2. Capsule glabrous, margined, not ciliate .... 3. *P. telephioides.*
3. Capsule narrowly winged, strongly ciliate .... 4. *P. glomerata.*

Tonic, expectorant, and emetic.

The following species are used medicinally in Europe—*P. amara* Linn., *P. calcarea* F. W. Schultz., *P. major* Jacq., *P. monspeliaca* Linn., *P. nicaeensis* Risso, *P. rupestris* Pourr., *P. serpyllacea* Weihe, *P. vulgaris* Linn.—; in Japan and China—*P. sibirica* Linn.—; in Indo China—*P. glomerata* Lour., *P. sibirica* Linn.—; in Malaya—*P. Reinii* Franch. & Sav., *P. sibirica* Linn.—; in North America—*P. polygama* Walt., *P. sanguinea* Linn., *P. senega* Linn.—; in Mexico —*P. scoparia* H. B. & Kunt—; in Brazil—*P. angulata* DC., *P. fimbriata* A. W. Ben., *P. paniculata* Linn.—; in Guiana—*P. timoutou* Aubl.—; in West Africa—*P. arenaria* Willd., *P. guineensis* Willd.—; in Southern Africa—*P. amatymbica* E. & Z., *P. arenaria* Willd., *P. hottentota* Presl., *P. myrtifolia* Linn., *P. oppositifolia* Linn., *P. serpentaria* E. & Z., *P. tenuifolia* Link.—; in Madagascar—*P. macroptera* DC.—.

P. amara and *P. senega* contain a toxic glucoside, polygalin.

OFFICIAL:—The root of *P. tenuifolia* Willd. (Japan), *P. senega* Linn. (all pharmacopoeias); the flowering plant of *P. amara* Linn. and *P. vulgaris* Linn. (Portugal); the root and plant of *P. amarum* Linn. (Denmark).

1. **Polygala crotalarioides** Ham. in Don Prodr. 199; Collett Fl. Siml. (1902) 43, fig. 14—PLATE 90.

Perennial, densely hairy. Rootstock woody, often tuberous. Stems short, thick, decumbent, branches long spreading. Leaves nearly sessile, ovate or oblong-ovate, 1.2-5 cm. Flowers purple, crowded in axillary racemes. Calyx persistent. Keel-petal crested. Capsule heart-shaped, fringed.

Distribution: Temperate Himalaya, from Simla and Chamba to Sikkim, 4,000—7,000 ft., Khasia Hills.

Used medicinally in catarrhal affections.

Among the Mundars of Chota Nagpur the root is chewed, or else

ground and drunk with water, to expel phlegm from the throat; it provokes coughing.

Royle states that the plant was sent to him with the information that the root was employed as a cure for snake-bite by the hill people of the Himalaya.

The plant is not an antidote to snake venom (Mhaskar and Caius).

Hasada: Birheremda—; *Mundari:* Heremda—; *Nagpuri:* Lilkanth, Nilkanth—; *Santali:* Lil kanthi—.

2. **Polygala chinensis** Linn. Sp. Pl. (1753) 704.—PLATE 91B.

Annual, 10-25 cm. high, erect, branched from the base, glabrous or pubescent. Leaves very variable, 1.2-3.8 cm. long, obovate, sub-orbicular or linear-oblong, rather thick, coriaceous, glabrous, ciliate, mucronate; petioles 2 mm. long, hairy. Flowers yellow, fading to pink, in axillary or extra-axillary, short, almost capitate, few-flowered racemes; crest of a single tubular appendage multifid only at the apex; pedicels very short; bracts small, membranous, oblong-ovate, acute, ciliate, persistent. Outer sepals broadly ovate, acuminate, with broad, membranous, ciliate margins. Wings herbaceous, oblique, ovate-oblong, accuminate, with narrow, membranous margins ciliate towards the base, longer than the capsule. Capsules didymous, orbicular-oblong, strongly ciliate, obliquely obcordate at the apex, narrowly margined. Seeds hairy; strophiole glabrous or nearly so, rounded at the apex, furnished with 3 membranous basal appendages.

Distribution: Throughout India, up to 5,000 ft.—Tropical Asia, Australia.

In Chota Nagpur the root is given in cases of fever and dizziness (Campbell).

English: Common Indian Milkwort—; *Gujarat:* Pilibhonyasana—; *Hasara:* Birminditasad—; *Hindi:* Meradu, Miragu—; *Marathi:* Negli—; *Nagpuri:* Danaminjo, Danaminju, Gurgur—; *Porebunder:* Pilibhoysana—; *Santali:* Gaighura—.

3. **Polygala telephioides** Willd. Sp. Pl. III, 876.—PLATE 91A.

An annual herb; stems very many from an annual woody root, prostrate, not exceeding 5-10 cm. in height, pubescent. Leaves sessile, 12-20 mm. margins usually recurved, glabrous, often imbricate, very thick, obovate or oblong, obtuse or acute. Bracts caducous before flowering. Flowers 2.5 mm. long, fascicled on very short, extra-axillary peduncles; outer sepals acute, wings herbaceous, oblique, acuminate. Capsule glabrous, not ciliate, 2 mm. broad and long, deeply notched; valves margined. Seeds minute, silky, strophiole minutely 3-appendiculate.

Distribution: Carnatic, in Nellore and Chingleput, Travancore, Ceylon.—Malay Archipelago, China.

Used medicinally in catarrhal affections.

4. **Polygala glomerata** Lour. Fl. Cochin. 426.

Stems many, 30-60 cm. high, densely pubescent, erect or ascending from a woody stock. Leaves 3.8-6.3 cm. long, broadly ovate or oblong to elliptic-lanceolate and linear. Racemes scattered, extra-axillary, very short, 2-3-flowered. Flowers drooping, 6-8 mm. long, green. Outer sepals acuminate, ciliate. Wings herbaceous, hatchet-shaped, acuminate and awned. Crest very small. Capsule narrowly winged, strongly ciliate. Seeds large, obovoid, silky. Strophiole with 3 short appendages.

Distribution: Sikkim, Assam, Khasia Hills, Burma.—Malay Archipelago, China.

In Indo China a decoction of the stems and leaves is given in inflammatory conditions.

Indo China: Kim bat hoan.

5. **Polygala sibirica** Linn. Sp. Pl. 702.—*P. Heyneana* Wight & Arn. 38 (not of Wall.).

Stems many, slender, 7.5-45 cm., hairy. Leaves round to elliptic, lanceolate and linear, 1.3-5 cm. long, shining margins often bent back. Racemes 2.5-7.5 cm. long, arising from the axils of leaves or outside the axils, with few or many flowers. Flowers blue. Sepals 5. Outer sepals short or long, blunt or short- or long-pointed, oblong-ovate or lanceolate. The 2 inner sepals petal-like, obliquely oblong or inversely ovate, blunt or pointed, rarely long-

pointed. Petals 3, the lower one keel-shaped and crested; crest usually large. Fruit a capsule, always smooth, broadly winged. Seeds hairy.

Distribution: Temperate and subtropical Himalaya, 1,000—6,000 ft., in Sikkim 8,000 ft., from the N.-W. Frontier and the Punjab to Bhutan, Khasia Hills, 4,000—6,000 ft., W. Ghats from the Nilgiris to Tinnevelly, chiefly above 6,000 ft.—China, Japan, Siberia.

In Japan, China, and Malaya the roots are given as a substitute for senega in colds and coughs.

In Indo China they are used as a diuretic; they are also given in bronchitis, amnesia, sexual impotency, and seminal losses.

Cantonese: Ven Chi—; *Chinese:* Yuan chih—; *English:* Japanese Senega—; *Indo China:* Nam vien chi, Re tieu thao, Vien chi—; *Japanese:* Himehagi—; *Malaya:* Yoan chee—.

FRANKENIACEAE.

Low herbs or undershrubs, much-branched and jointed at the nodes. Leaves opposite, small, without stipules, often clustered in the axils. Flowers usually pink or purple, sessile in the forks of the branches, forming a more or less dense, terminal, leafy cyme, sometimes contracted into a globular head, regular, hermaphrodite. Calyx tubular, persistent, with 4, 5, or rarely 6 lobes, valvate in the bud, and as many prominent angles and furrows. Petals as many, hypogynous, imbricate in the bud, free, the claws with an adnate plate or appendage on the inner face, the lamina spreading. Stamens usually 6, sometimes 4 or 5 or indefinite, hypogynous, free or shortly united in a ring at the base, filaments filiform or flattened; anthers 2-celled, versatile. Ovary free, sessile, 1-celled, with 3, rarely 2 or 4 parietal placentas, or very rarely a single one. Style filiform, with as many branches as placentas, the stigmas capitate or oblique. Ovules several, or rarely solitary, to each placenta, attached to rather long ascending funicles, amphitropous or nearly

anatropous, with an inferior micropyle. Seeds ovoid or oblong, testa crustaceous, the hilum almost terminal. Embryo straight, in a mealy albumen, the radicle next the hilum, shorter than or as long as the cotyledons.—Genera 4. Species 60.—Tropical and temperate salt-loving plants.

The Order is medicinally unimportant.

FRANKENIA Linn.

Much-branched herbs or small undershrubs, affecting maritime or saline localities. Leaves small opposite exstipulate, often fascicled. Flowers rose to purple, sessile and solitary in the numerous forks or fascicled in leafy heads or cymes, regular, hermaphrodite. Calyx gamosepalous, tubular, persistent, 4-6-toothed. Petals as many as calyx-teeth, free, clawed, with a lamelliform appendage on the inner side of the claw. Stamens usually 6, hypogynous, free or very shortly connate at the base, rarely cohering above; filaments flattened or filiform; anthers 2-celled, didymous, dehiscing longitudinally. Ovary 1-celled, with 3 (2-4) parietal multiovulate placentas; style simple, filiform; stigmas 3 or as many as placentas. Capsule enclosed in the persistent calyx, dehiscing in as many valves as placentas. Seeds albuminous, with a straight axile embryo.—Species 32.—Temperate and subtropical sea-coasts.

This genus is therapeutically inert.

1. **Frankenia pulverulenta** Linn. Sp. Pl. (1753) 332; Lam. Ill. t. 262.—PLATE 92.

A diffuse or procumbent, much-forking herb, 10-20 cm. in height, with opposite, obovate oval or rotundate, often fascicled leaves, usually mealy-puberulous or setulose-pubescent beneath, flattish or with the margins more or less recurved, narrowed into short ciliolate or nearly glabrous petioles, less than 4 mm. in length. Calyx tubular, with short acute teeth, equalling the leaves. Filaments membranous, dilated, tapering above and below.

Distribution: Sind, Baluchistan, Punjab.—A widespread species on shores and in salt deserts, Arabia, Mediterranean, Senegal, Cape.

Valued by native practitioners in the fresh state for its

mucilaginous and aromatic properties; exhibited in the form of decoction in empyreuma (Murray).

Malta: Mealy Sea-heath—; *Sind:* Khareeya—.

CARYOPHYLLACEAE.

Herbs, sometimes a little woody at the base. Leaves opposite, usually quite entire; stipules scarious, setaceous or 0. Flowers bisexual or rarely unisexual. Sepals 4-5, free and imbricate in bud or united into a toothed calyx. Petals 4-5 entire toothed or bifid, sessile or clawed or sometimes 0. Stamens 8-10, rarely fewer, inserted with the petals and sometimes slightly adherent to them; anthers 2-celled, cells parallel, dehiscing lengthwise. Disk annular or grandular or elongated into a gynophore. Ovary free, 1-celled or imperfectly 3-5-celled; styles 2-5, free or connate, stigmatose on the inner side; ovules 2 or many on a free central or a basal placenta. Fruit a dry capsule, dehiscing by teeth or valves equal to or double in number to the styles or rarely indehiscent or irregularly dehiscent. Seeds few or many, rarely solitary; albumen mealy or rarely fleshy; embryo usually curved round the albumen; cotyledons frequently incumbent.—Genera 80. Species 1,300—Cosmopolitan.

A. Capsule shortly 4-valved, bursting by short or long valves. Hilum lateral. Calyx veined, styles 2 .... SAPONARIA.

B. Sepals free, scarious, not keeled; petals sub-sessile and stamens inserted on an annular disk, styles 3-2, combined. Stigma 3-toothed .... POLYCARPEA.

Cooling, resolvent, slightly bitter; the roots and seeds are sometimes acrid.

Glucosides—agrostemma sapotoxin, gypsophilin, saponarin, saporubin—have been obtained from various members.

OFFICIAL:—*Saponaria officinalis* Linn. (France, Germany)= *Bootia vulgaris* Necker (Portugal).

SAPONARIA Linn.

Annual or perennial herbs. Leaves flat. Flowers in dichotomous cymes. Calyx more or less tubular, ovoid or oblong, 5-toothed, nerves obscure. Petals 5, with a narrow claw; limb entire or emarginate, with or without a basal scale. Stamens 10. Torus small or produced into a short gynophore. Ovary 1-celled or septate at the very base; ovules many; styles 2. Capsule ovoid or oblong, opening at the apex by 4 teeth or short valves. Seeds reniform or subglobose, laterally compressed, having the hilum on one of the margins; embryo hemispheric, forming nearly a circle.—Species 20.—N. Temperate, chiefly Mediterranean.

The leaves are commonly used as a resolvent in the treatment of boils and itch.

The following are used medicinally:—in Europe—*S. ocymoides* Linn., *S. officinalis* Linn., *S. vaccaria* Linn.—; in China and Indo China—*S. vaccaria* Linn.—.

OFFICIAL:—The root of *S. officinalis* Linn. in France and Portugal.

1. **Saponaria vaccaria** Linn. Sp. Pl. (1753) 400.—*S. perfoliata* Roxb. Fl. Ind. II, 445.—PLATE 93.

A tall robust annual, 30-60 cm. high; branches quite glabrous. Leaves 2.5-6.3 by 0.6-2 cm., sessile, glabrous; the lower oblong, acute, the upper oblong-lanceolate, very acute or mucronate. Flowers in corymbose dichotomous cymes; pedicels slender, 2.5-5 cm. long; bracts foliaceous. Calyx 12 mm. long, ventricose in fruit, with 5 broad green nerves and scarious margins; teeth triangular. Petals rosy, obovate, slightly emarginate; claw shortly exserted; limb 12 mm. long. Capsules included, broadly ovoid. Seeds globose, black, granulate.

Distribution: A weed of cultivation throughout India.—Temperate and subtropical regions.

The plant is bitter and slightly sour; good in enlargement of the spleen, dysmenorrhoea, and ulcers.—. Leaves good for scabies and itch (Yunani).

The mucilaginous sap of the plant is considered to have febrifuge and tonic properties in long-continued fevers of a low type.

It is used in the cure for itch (Murray).

In Indo China the plant is used as a mild depurative. In China it is used in furunculosis and scabies.

The leaves and roots contain from 8 to 15 per cent of saponin.

Arabic: Gafis—; *Bengal:* Sabuni—; *Chinese:* Wang Pu Liu Hsing—; *English:* Cowherb, Soapwort—; *French:* Blé de vache, Copatte, Saponaire ă vaches—; *Hindi:* Musna—; *Hova:* Savonimbary—; *Indo China:* Vuong bat luu hanh—; *Italian:* Cetino—; *Malta:* Cow Basil, Cow-herb, Cetino, Mazzettino—; *Persian:* Gafis, Guligafas—; *Santal:* Musna—; *Sind:* Musna—.

POLYCARPEA Lam.

Annual or perennial herbs, usually erect. Leaves linear or rarely ovate, often appearing whorled by the presence of secondary axillary fascicles; stipules scarious. Flowers in lax or contracted or capitate cymes, often showy from the white, rosy or purple, scarious sepals. Sepals 5, scarious, or rarely herbaceous and scarious at the margins only. Petals 5, entire 2-teethed or with the margins erose. Stamens 5, slightly perigynous or subhypogynous, or cohering with the petals into a ring or tube. Ovary 1-celled; ovules many; style elongate, 3-grooved, 3-fid or 3-dentate. Capsule 3-valved. Seeds obovoid or compressed; embryo curved, rarely almost straight. —Species 30.—Cosmopolitan.

Astringent, demulcent, maturant, and antiseptic properties.

P. arenaria Gagnep. is used medicinally in Indo China, *P. corymbosa* Lam. in Malaya and Transvaal, *P. linearifolia* DC. in Nigeria.

1. **Polycarpea corymbosa** Lam. Ill. II (1793) 129.—PLATE 94.

An erect, annual herb, 15-45 cm. high, sometimes woody below, dichotomously branched; branches slender terete, the young ones hoary-pubescent. Leaves 8-20 mm. long, narrow-linear, mucronate; stipules lanceolate, very acute, 1-nerved. Flowers numerous, small,

in dense much-branched, terminal cymes, forming flat-topped heads; pedicels hoary-pubescent; bracts 3 mm. long, silvery white, bristle-pointed. Sepals lanceolate, very acute, scarious, silvery-white or coloured, much exceeding the petals and capsule. Petals less than half the length of the sepals. Capsules very small, shining, brown.

Distribution: Cosmopolitan.

The herb is useful in strangury, urinary calculi, boils, inflammatory swellings, and ulcers. Its ash mixed with pepper is applied externally to boils and ulcers (Ayurveda).

The pounded leaves are used as poultice, warm or cold over boils and inflammatory swellings.

In Pudukotah the herb is administered both externally and internally as a remedy for the bites of venomous reptiles. In Porebunder, the pounded leaves are used for bites from animals, and given with molasses in the form of a pill in jaundice.

In Malaya, the drug is found in the shops as flowering heads, arising from silvery cymes, with portions of the stem and tomentose leaves, and is used as a demulcent and astringent.

Whether administered internally or applied externally the herb is useless in the treatment of snake-bite (Mhaskar and Caius).

Chinese: Pai T'ou Weng—; *Hausa:* Bakin suda—; *Malaya:* Pak thow yoong—; *Porebunder:* Okharad—; *Sanskrit:* Bhisatta, Okharadi, Tadagamritikodbhava—; *Santal:* Janhenanjur—; *Tamil:* Nilaisedachi—; *Telugu:* Bommasari, Rajuma—.

PORTULACACEAE.

Herbs, rarely undershrubs, usually glabrous and more or less succulent. Leaves opposite or alternate, entire, often fleshy; stipules scarious or lacerate, sometimes changed into hairs or 0. Inflorescence various, usually terminal; flowers regular, hermaphrodite. Sepals fewer than the petals, usually 2, free or adnate to the ovary

at the base, much imbricate. Petals 4-5, rarely more, hypogynous or perigynous, free or connate at the base, imbricate, entire, fugacious. Stamens 4-many, inserted with the petals and often adnate to them at the base; filaments filiform; anthers 2-celled, cells parallel, dehiscing longitudinally. Ovary free or semi-inferior, 1-celled; ovules 2-many on basal funicles or a central column, amphitropous; style 2-8-fid, branches longitudinally stigmatose. Capsule membranous or crustaceous, circumsciss or dehiscing by as many valves as there are styles. Seeds many or solitary, compressed; embryo curved round mealy albumen.—Genera 17. Species 225.—Cosmopolitan, but specially American.

Succulent insipid plants of little therapeutical value.

PORTULACA Linn.

Diffuse or ascending, fleshy herbs. Leaves alternate or sub-opposite; stipules scarious or reduced to fascicles of hairs or scales (nodal appendages) at the nodes, or 0. Flowers terminal, solitary or clustered, surrounded by a whorl of leaves. Sepals 2, united at the base into a tube adnate to the ovary, the free part above deciduous. Petals 4-6, distinct or a little united at the base, inserted on the top of the tube of the calyx just where it becomes free from the ovary. Stamens 8 or numerous, inserted at the base of the petals; filaments subulate or filiform. Ovary ovoid, semi-inferior, 1-celled; ovules numerous; style deeply 3-8-fid. Capsule membranous, semi-inferior, the free part circumsciss. Seeds numerous, compressed, reniform, the crustaceous and shining testa often granulate; embryo peripheric. —Species 2.—Tropical and subtropical.

A. Nodes without appendages. Flowers in clusters .... 1. *P. oleracea.*
B. Nodes with a ring of hairs.
   1. Leaves opposite .... 2. *P. quadrifida.*
   2. Leaves alternate, root tuberous .... 3. *P. tuberosa.*

Fleshy, insipid plants. They are considered cooling diuretic, and recommended in scurvy and urinary affections.

The following are used medicinally:—in Europe— *P. oleracea* Linn.—; in China and Indo China—*P. oleracea* Linn., *P. sativa* DC.—; in the Philippine Islands—*P. oleracea* Linn., *P. quadrifida*

Linn.—; in the United States—*P. oleracea* Linn—; in Brazil—*P. patens* Linn., *P. pilosa* Linn—; in Guinea—*P. oleracea* Linn.—; in the Gold Coast—*P. oleracea* Linn., *P. quadrifida* Linn.—; in Southern Africa and Portuguese East Africa—*P. quadrifida* Linn.—; in La Reunion and Madagascar—*P. oleracea* Linn.—.

1. **Portulaca oleracea** Linn. Sp. Pl. (1753) 445.—PLATE 95.

An annual succulent prostrate herb; stems 15-30 cm. long, reddish, swollen at the nodes, quite glabrous. Leaves fleshy, subsessile, 6-25 mm. long, alternate or subopposite, cuneiform, rounded and truncate at the apex, spangled when fresh with glistening dots, margins reddish; stipules (or nodal appendages) 0. Flowers few together, in sessile terminal heads. Sepals unequal, obtuse. Petals 5, obovate, yellow. Stamens 8-12. Style 3-8-(often 5-) partite. Capsules ovoid, circumsciss. Seeds numerous, black, concentrically striate and granulate.

Distribution: All over India, up to 5,000 ft. in the Himalaya.—All warm countries.

The leaves are sour, bitter, saltish; difficult to digest, cause biliousness; stomachic, alexipharmac, laxative; destroy "vata" and "kapha;" reduce small tumours and inflammations; good for ulcers, asthma, urinary discharges; cure diarrhœa, dysentery, leprosy, and piles (Ayurveda).

The leaves are sour; recommended in bilious conditions and low fevers; allay thirst and headache; tonic; stop vomiting; good in diseases of the kidney and the spleen, in stomatitis of children, piles, scalds and burns; should not be given to persons suffering from cold with or without cough (Yunani).

At the present day, the herb is chiefly valued as a refrigerant and alterative pot herb, particularly useful as an article of diet in scurvy and liver disease. In addition to the properties above detailed, the seeds are believed in the Punjab to be vermifuge.

The juice of the stems may be applied with advantage to prickly heat, as well as to the hands and feet when a burning sensation is felt.

The juice of the stems and leaves is applied to scorpion sting.

In Jamaica it is employed as a cooling and moistening herb in "burning fevers." Bruised, it is applied to the temples to allay "excessive heat" and pain, and the juice is "of use in spitting of blood."

In North America it has been considered a cooling diuretic, and the seeds at one time were thought to be anthelmintic, though now known to be inert.

In Indo China the juice of the fresh leaves is applied to abscesses, and used as a collyrium; a decoction is given in dysentery.

In Nigeria the leaves are used as a local application to swellings.

In the Gold Coast the leaves are ground, mixed with oil, and tied on boils to bring them to a head. Eaten with tiger nuts they are used for skin diseases. Placed in cold water and taken frequently they also serve as a heart tonic.

The plant is not an antidote to scorpion venom (Caius and Mhaskar).

Afrikaans: Misbredie, Porselein, Postelein, Varkkos—; *Akim:* Adwera—; *Arabic:* Baglatulhumqa, Buklutulkukema, Khurfa, Kurfakara—; *Ashanti:* Adwera—; *Bengal:* Baraloniya, Chhotalunia, Kulfi, Munya—; *Betsileo:* Kalabotetraka—; *Bicol:* Ausiman—; *Bombay:* Gol, Kurfah, Motighol—; *Burma:* Mayabyit—; *Canarese:* Dudagorai—; *Central Provinces:* Ghol, Gholu—; *Ceylon:* Pulichankirai—; *Chinese:* Ma Ch'ih Hsien—; *Danish:* Portulak—; *Deccan:* Khulfekibhaji—; *Dutch:* Porselein—; *English:* Common Purslane, Garden Purslane, Pot Purslane, Purslane—; *Ewe:* Afla, Aflangtokpui—; *French:* Porcelin, Porcellane, Pourcellaine, Pourcellane, Pourpier, Pourpier commun, Pourpier cultivé—; *Ga:* Awrorke—; *German:* Portulak—; *Greek:* Andrachni, Andrakla, Andraklida, Antrakla—; *Gujerat:* Loni, Mhotiluni—; *Hausa:* Dabrin saniya, Fasa Kabba, Fasa Kumburi, Harshen saniya, Sarikin jibji—; *Hindi:* Baralunia, Chhotalunia, Khurfa, Khursa, Kulfa, Kurfa, Kurfekasag, Lonia, Lunia, Luniakulfah, Lunuk, Muncha, Munya, Nonkha, Nonkhalunuk—; *Hova:* Tsikobokobondanitra—; *Indo China:* Ma si hien, Rau sam—; *Italian:* Porcellana, Portulaca—; *Jhalawan:* Pichli, Shurdako—; *Kachhi:* Lunak, Pichlo—; *Kalmuk:* Assun obison—; *Kohlu:* Lunak—; *Konkani:* Gol, Golchibagi—;

Krepi: Aflangtokpui—; *Krobo:* Nereyu—; *Kumaon:* Lunak, Luniyakulfah—; *Languedoc:* Poutou laigo—; *La Reunion:* Pourpier, Pourpier rouge—; *Las Bela:* Manshuri—; *Madras:* Pasalai—; *Malaya:* Segan—; *Malayalam:* Koricchira—; *Malta:* Purslane, Porcellana, Sportellacchia, Burdliecka—; *Marathi:* Bhuigholi, Ghole, Mhotighol—; *Mundari:* Dailara, Urialangara—; *Nasirabad:* Lunak—; *North-Western Provinces:* Desikulfah, Lunak, Luniya, Muniya—; *Persian:* Cholza, Kherefeh, Khurfah, Kurfah, Tirehkhurfeh, Turk, Turuk—; *Polish:* Kurza nega—; *Porebunder:* Mhotiluni—; *Portugeuse:* Beldroega—; *Pushtu:* Murlai, Tursbuk, Warkharai—; *Roumanian:* Iarba grasa, Portulaca—; *Russian:* Portulak, Schrucha—; *Sadani:* Dailsag—; *Sakalave:* Fandrianomby—; *Sanskrit:* Brihalloni, Gholika, Lona, Loni, Lonika, Lunia—; *Santal:* Mota uric alang—; *Shahrig:* Lunak—; *Sind:* Lonk—; *Sinhalese:* Gendakola—; *Spanish:* Verdolaga—; *Suto:* Selele—; *Swedish:* Portulak—; *Tagalog:* Colasiman, Golasiman, Olasiman, Sayican—; *Tamil:* Karikkirai, Parupukkirai, Passalakkirai, Pulikkirai—; *Telugu:* Boddupavilikura, Gangapavilikura, Pappukura, Peddapavilikura—; *Toba:* Khulfa, Mirri—; *Twi:* Adwerair—; *Urdu:* Khurfah—; *Uriya:* Purunisag—.

2. **Portulaca quadrifida** Linn. Mant. (1767) 73; Wight Ill. II, t. 100.—*P. meridiana* Linn. f. Suppl. 248; Roxb. Fl. Ind. II, 463.—Plate 96A.

A small diffuse annual; stems filiform, glabrous, rooting at the nodes. Leaves opposite, fleshy, 3-6 mm. long, ovate, acute; stipules (or nodal appendages) a ring of silvery hairs; petioles short. Flowers terminal, solitary, subsessile, surrounded by silvery hairs and an involucre of 4 leaves. Sepals broadly oblong, rounded at the apex. Petals 4, yellow, oblong-obovate. Stamens 8. Style slender, 4-fid to near the middle. Capsules conical. Seeds minutely tubercled.

Distribution: Throughout the warmer parts of India and Ceylon.—Tropical Asia and Africa.

The plant is sour, bitter, hot, alterative, laxative; causes biliousness and "kapha;" cures low fevers, asthma, cough, urinary dis-

charges, inflammations; good for eye diseases, skin diseases and ulcers (Ayurveda).

The seeds and leaves are used for the same purposes as those of *P. oleracea.*

The bruised fresh leaves of this acid and pleasant-tasted purslane are prescribed by the Tamool practitioners as an external application in *akki,* erysipelas; an infusion of them is also ordered as a diuretic in dysuria, to the extent of half-a-teacupful twice daily (Ainslie).

In the Gold Coast the plant is used to cure toothache.

The Zulus use an infusion as an emetic.

In Portuguese East Africa, the natives take a decoction of the plant as an anthelmintic, and in the treatment of stomach complaints and gonorrhœa.

Arabic: Baglatulaarabbiyah, Baglatulyamaniyah, Budelutulmubarik—; *Ashanti:* Araseneaboor—; *Bengal:* Chhotaluniya, Muniya—; *Bombay:* Barikaghola, Chavalkebhaji, Kota—; *Canarese:* Halibachcheli—; *Deccan:* Chaunlayikibhaji, Chowli, Gholkibhaji—; *Gold Coast:* Stone Crop—; *Gujarat:* Jhiniluni, Luni—; *Hindi:* Chaunlayi, Chotaluniya, Khatechawal, Loniya—; *La Reunion:* Pourpier marron—; *Madras:* Sirupasalai—; *Malay:* Rumput segan—; *Marathi:* Kathechanval, Ranghol—; *Porebunder:* Badhi, Jinkiluni—; *Portuguese East Africa:* Sanimarumbi—; *Punjab:* Haksha, Lunak, Lunkibuti—; *Sanskrit:* Kshudragholika, Laghughonika, Laghulonika, Upadyki—; *Sinhalese:* Hingendakola—; *Tagalog:* Sayican—; *Tamil:* Passalaikkirai, Passelikkirai, Sinnaparpukkirai, Siruppassaraikkirai—; *Telugu:* Goddupavili, Kura, Pavili, Payalaku, Peddapavili, Saunapappu Saunapavili, Sunapailkura—.

3. **Portulaca tuberosa** Roxb. Hort. Beng. (1814) 91.—PLATE 96B.

A perennial succulent herb; root thick, fusiform; branches numerous, prostrate, glabrous, 5-10 cm. long. Leaves alternate, 1.2-2 cm. long, fleshy, linear-oblong, obtuse or acute; stipules (or nodal appendages) a ring of long brownish hairs. Flowers terminal solitary, sessile, surrounded by a ring of brownish hairs and an

involucre of 6-8 long leaves. Petals 5, yellow. Stamens 20 or more. Style filiform, 5-cleft at the apex. Capsules ovoid, with a short conical top, smooth and polished. Seeds black, granulate.

Distribution: Bihar, Sind, Gujarat, dry districts of the Carnatic from S. Arcot to Travancore, Ceylon.

The fresh acid leaves are used medicinally; an external applica-cation is prescribed by native practitioners in erysipelas and an infusion in dysuria (Murray).

Marathi: Jangligajar—; *Sind:* Lunuk—; *Sinhalese:* Uragenda—; *Telgu:* Boddakura—.

TAMARICACEAE.

Mostly bushes or small trees. Leaves minute, scale-like, rarely sheathing, sometimes fleshy, exstipulate. Flowers white or pink, small, regular, in spikes or crowded racemes. Sepals and petals 5 each or rarely 4, sometimes a little connate below. Stamens 4-10 or many, free or connate below; anthers versatile. Disk 10-glandular. Ovary free, 1-celled or imperfectly 2-5-celled; styles 2-5, free or connate; ovules 2-many on each of the 2-5 basal placentas. Capsule 3-valved. Seeds plumed with a crest of long hairs or winged.—Genera 5. Species 100.—Temperate and subtropical regions, desert, shore and steppe.

1. Stamens free, style 3 .... Tamarix.
2. Stamens connate, stigma sessile .... Myricaria.

Aperient, tonic, and astringent properties are occasionally found among the members of this Order.

Methyl quercetin and tannic acid are so far the only compounds isolated.

Tamarix Linn.

Shrubs or small trees. Leaves minute, scale-like, amplexicaul or sheathing. Flowers white or rosy, spicate or densely racemose.

Sepals 4-5 (rarely 6), free. Petals inserted beneath a glandular-crenate, angled or lobed disk, free or slightly connate at the base. Stamens 5-10 (rarely 4 or 11-12), inserted on the disk, free, or scarcely connate at the base into a ring. Ovary attenuated at the apex; ovules many; styles 3-4 (rarely 2-5), short, thick; placentas very short, basal. Capsule 3-4-valved. Seeds many, small, glabrous, produced at the apex into a sessile plume, the axis of which is setiform and feathered with long hairs; albumen 0; embryo ovoid-oblong.—Species 65.—Europe, Mediterranean, Asia.

Stamens 5.
1. Flowers bisexual, in racemose panicles .... 1. *T. troupii.*
2. Flowers unisexual, in close cylindrical spikes .... 2. *T. dioica.*
3. Flowers bisexual, in usually interrupted spikes .... 3. *T. aphylla.*

The bark and the galls are astringent; the manna is detergent and aperient; the twigs and the leaves are vulnerary, carminative, and diuretic.

The following are used medicinally:—in Europe and North Africa—*T. gallica* Linn., *T. africana* Poir.—; in Arabia and Persia—*T. aphylla* Krst.—; in China—*T. chinensis* Lour.—; in Indo China—*T. chinensis* Lour., *T. pallasii* Desv.—; in Malaya—*T. chinensis* Lour.—.

1. **Tamarix troupii** Hole in Ind. For. XLV (1919) 247.—*T. gallica* Dyer in Hook.f. Fl. Brit. Ind. I, 248, et multorum auct. quoad species e Punjab, Sind, U. Provinces, Mt. Abu (non Linn.); Brandis For. Fl. t. 5.—*T. gallica* Linn. does not occur in India.—PLATE 97 (under *T. gallica*).

A shrub or small tree, with slender erect or pendulous branches. Leaves 2.5-4 mm. long, subulate-acute from a triangular semi-amplexicaul base, at first imbricate, afterwards distant. Flowers hermaphrodite, numerous, crowded, in slender lateral and terminal panicled spike-like racemes; pedicels short; bracts very acute, immediately beneath the flowers. Sepals 5, much shorter than the petals, triangular-ovate, margins minutely denticulate. Petals oblong, rounded and often notched at the top, pink. Disk 5-lobed; lobes entire or nearly so. Stamens 5, inserted at the margins of the middle of the lobes of the disk. Ovary bottle-shaped, trigonous, truncate at top;

styles 3, articulated to the ovary. Capsules about 4 mm. long, conical, somewhat trigonous, tapering, pale pink, glabrous. Seeds with a plume of white hairs.

Distribution: Punjab, U. Provinces, Sind, Baluchistan, Mt. Abu.

The bark is bitter, astringent, tonic; the fruit, astringent (Ayurveda).

The fruit and the leaves are sour and slightly bitter; good astringent used for dysentery and old chronic diarrhoea; detergent; good in leucoderma, spleen troubles, eye diseases; the decoction as a gargle is good for the gums; the steam from the cooked leaves is good for piles, ulcers, and wounds (Yunani).

The galls are employed medicinally as an astringent, and adminstered internally in dysentry and diarrhœa.

The manna is considered to be detergent, aperient, and expectorant.

The colouring mattter extracted from the leaves and stems is a methylquercetin.

As much as 40 per cent. tannic acid has been found in the galls.

Arabic: Asl, Tarfa, Turfah—; *Baluchistan:* Gazkhera, Gazsurkh, Ghazlei—; *Bengal:* Jhau, Jhav—; *Catalan:* Tamarit, Tamariu—; *Ceylon:* Kiri—; *Deccan:* Jhav—; *English:* Tamarisk—; *Gujarat:* Jhavnujhada—; *Hindi:* Jhau, Jhav—; *Italian:* Cipressina, Scopa marina—; *Konkani:* Jahu—; *Malayalam:* Jhavukam—; *Persian:* Gaz, Gazshakar, Shorgaz—; *Punjab:* Jhau, Koa, Lai, Lainya, Pilchi, Rukh—; *Pushtu:* Gazsurkh, Ghaz, Suragaz—; *Sanskrit:* Aphala, Bahugranthika, Jhavu, Jhavuka, Pichula, Shavaka—; *Sind:* Jhaw, Lai, Lei—; *Spanish:* Taray—; *Tamil:* Attalari, Attuchavakku, Kodaichavukku, Sirusavukku, Sivappattuchavukku, Sivappukkodaichavukku, Sivappusirusavukku, Vannikkay—; *Telugu:* Erusaru, Ettasirusaru, Ettayerusaru, Pakke, Pakkepakki, Palligi, Prakke, Sirasaru—; *Tibet:* Rgeeta, Telta—; *Urdu:* Jaheva—.

2. **Tamarix dioica** Roxb. Hort. Beng. (1814) 22; Brandis For. Fl. t. 6.—*T. gallica* Wight. Ill. t. 24A (non Linn.).—*T. articulata* Wall. Cat. 3756 (non Vahl).—PLATE 98.

A small dioecious tree with a short trunk; branches spreading

with drooping extremities. Leaves sheathing, glabrous, obliquely truncate, abruptly acuminate. Flowers 3 mm. diam., in dense peduncled spikes, 2.5-5 cm. long, forming drooping terminal panicles; peduncles about equalling the spikes; bracts lanceolate, acuminate, with membranous margins, persistent. Sepals about half as long as the petals, elliptic-obovate and with a strong midrib, margins membranous. Petals elliptic-oblong, pink. Stamens 5, inserted in the notches of the minute 5-lobed disk (in the female flowers reduced to short filaments usually without anthers); filaments ligulate. Styles 3, as long as the ovary; stigmas clavate, truncate.

Distribution: Throughout N. India, up to 2,500 ft. in the outer Himalayan valleys, Sind, the Peninsula of Bombay, Bengal, Assam, Santal Parganas and in the dry zone of Burma. Common along the Ganges, Hooghly, and forms extensive forests along the Indus in Sind. Also found along the sea-coast, Mt. Abu, in sandy river-beds and on the sea-coast of the Madras Presidency.—Afghanistan.

The twigs and galls are used in medicine as an astringent (Stewart).

Bengal: Laljhau—; *Burma:* Byaungchedauk—; *Hindi:* Jau, Jhau, Laljhau—; *Kumaon:* Jhau—; *Ladak:* Rgelta—; *Merwara:* Jhau, Kachlei, Pilchi—; *Oudh:* Jhau—; *Punjab:* Faras, Farwan, Ghazlei, Harwan, Jhau, Kachlei, Koan, Lai, Leh, Lei, Panj, Panjpilchi, Pilchi, Rukh—; *Pushtu:* Khwa—; *Sanskrit:* Pisula—; *Sind:* Gas, Jao, Lao, Lyi, Turunjabin—; *Tamil:* Attumari, Nirumari—; *Telugu:* Palivela, Palligi—.

3. **Tamarix aphylla** Lanza in Boll. Orto Bot. Palermo VIII (1909) 82; Blatter Fl. Arab. (1919) 72.—*Thuya aphylla* Linn. Cent. Pl. I, 32.—*Tamarix articulata* Vahl Symb. Bot. II (1791) 43, t. 32.—PLATE 99 (under *T. articulata* Vahl).

A shrub or small tree, reaching 18 m. high; the slender ultimate branches hoary with a saline efflorescence from the impressed, punctate glands. Leaves reduced to a short sheath, the free part to a small triangular tooth. Flowers hermaphrodite, in slender, usually interrupted spikes; bracts sheathing, acute, shorter than the flowers. Sepals 5, broadly elliptic, much shorter than the petals, enitre or minutely toothed. Petals oblong, conniving at the top. Stamens 5; filaments filiform, inserted in alternate notches of the 10-lobed disk. Capsules

trigonous, rounded at the tip; styles 3, about half the length of the ovary; stigmas ovoid.

Distribution: Punjab plains, Sind, Cutch, Baluchistan,—Persia, Mesopotamia, Arabia, Mediterranean, S. Africa.

The galls are employed as an astringent.

The bark is bitter, astringent; powdered, and in combination with oil and *Kamala*, it is used as an aphrodisiac. It is also employed as an application in eczema capitis, and other diseases.

Afrikaans: Abiekwas-geelhout, Dawee—; *Arabic:* Aslularmar, Tarfalahmar—; *Bengal:* Raktajhav—; *Deccan:* Laljhav—; *Gujarat:* Laljhav—; *Helmand:* Kohragaz—; *Hindi:* Laljhav—; *Kharan:* Siahgazz—; *Las Bela:* Kirri—; *Northern Baluchistan:* Kirri—; *Pahrod:* Gagaz, Shakargaz—; *Persian:* Farash, Gazesurkh, Khoragaz —; *Punjab:* Faras, Farash, Farwa, Ghwa, Ghuz, Khagal, Kharlei, Narlei, Pharwan, Rukh, Ukhan—; *Pushtu:* Ghwa, Ghwaz—; *Sind:* Asrelei, Asri, Gaz, Gazlau—; *Southern Africa:* Tamarisk—; *Tamil:* Sivappattushavukku, Sivappukkottashavukku, Sivappusirushavukku—; *Telugu:* Ettashirisaru, Ettaverusaru—.

Myricaria Desv.

Fastigiate shrubs. Leaves small, flat, sessile, often crowded. Flowers white or pink, hermaphrodite, in lateral or terminal spike-like racemes. Sepals 5. Petals 5, free. Stamens 10, alternately long and short, monadelphous. Disk almost obsolete. Stigmas 3, sessile; placentas basal; ovules numerous. Seeds usually with a stalked plume.—Species 10. —N. temperate regions of the Old World.

1. Bracts ovate, about twice as long as the pedicels .... 1. *M. elegans.*
2. Bracts ovate-lanceolate, 3-4 times as long as the pedicel .... 2. *M. germanica.*

Bark aperient and slightly astringent.

M. germanica Desv. is used medicinally in Spain.

1. **Myricaria elegans** Royle Ill. Bot. Himal. 214.—Plate 100.

An erect deciduous shrub, 3-4.5 m. high. Twigs smooth, glabrous, reddish-brown. Bark grey or dark brown, rough, with

numerous small fissures. Branches bearing fascicled deciduous side-shoots 5-15 cm. long. Leaves 8-20 mm. by 2.5-3.8 mm., oblong-lanceolate, narrowed at both ends, entire, glaucous-blue, glabrous. Flowers pink or white, in lateral and terminal spike-like racemes 5-13 cm. long, sometimes forming a terminal panicle up to 20 cm. long. Pedicels up to 2.5 mm. long. Bracts 2.5-5 mm. long, with narrow membranous margins. Petals white. Calyx and pedicels green or pink. Capsule 6-8.5 mm. long.

Distribution: W. Himalaya, Kunawar, Spiti, Lahul, Ladakh, Kumaon, up to 14,000 ft.

The leaves form an application to bruises, &c., in Lahoul (Aitchison).

Garhwal: Wombu—; *Punjab:* Humbu, Umbu.

2. **Myricaria germanica** Desv. in Ann. Sc. Nat. IV, 349.

A deciduous shrub with erect or decumbent stems 0.3-0.9 m. high and up to 1.3 cm. diam. Twigs smooth, glabrous, reddish—or purplish-brown, bearing fascicled deciduous side-shoots usually 1.3-10 cm. long. Leaves 2.5-7.5 mm. long, linear-lanceolate, entire, glaucous-blue, glabrous. Flowers pink, in lateral and terminal spike-like racemes 5-15 cm. long, sometimes forming a terminal panicle up to 45 cm. long. Pedicels up to 2.5 mm. long. Bracts 4-8 mm. long with broad membranous margins. Petals white. Calyx and flowering rhachis purplish-red. Capsule 8-13 mm. long.

Distribution: Temperate and alpine Himalaya, from Sikkim to Kumaon, 10,000—14,000 ft.,—Afghanistan, westwards to Europe.

A decoction of the bark is used in Spain as an aperient and in jaundice.

ELATINACEAE.

Semiaquatic or terrestrial herbs or undershrubs. Leaves opposite or whorled, entire or serrate; stipules twin. Flowers hermaphrodite, small, regular axillary, solitary or cymose. Sepals 2-5, free, imbri-

cate. Petals as many, hypogynous, imbricate. Disk 0. Stamens equal in number to the petals or twice as many, hypogynous, free; anthers versatile, 2-celled, the cells dehiscing longitudinally. Ovary free, the cells as many as the sepals; ovules numerous, on the inner angles of the cells, horizontal or subascending, anatropous; raphe lateral or ventral; styles as many as the cells, distinct from the base; stigmas capitate. Capsule septicidal; valves flat, concave or incurved, separating from a central placentiferous and often more or less septiferous column. Seeds straight or curved; raphe on the concave side; testa often rugose or ribbed; albumen 0, or very thin; embryo conform to the seed; cotyledons short; radicle next the hilum.—Genera 2. Species 30.—Tropical and temperate regions.

The Order is of little importance therapeutically.

Bergia Linn.

Herbs or undershrubs, erect, decumbent or diffusely branched, often pubescent. Leaves opposite, serrate or sometimes entire. Flowers small, axillary, solitary or cymosely fascicled, usually 5-merous. Sepals acute with an herbaceous midrib, the margins usually membranous. Ovary ovoid. Capsule subcrustaceous, septicidal.—Species 25.—Tropical and temperate regions.

B. odorata Edg. is used medicinally in Hausa, *B. decumbens* Planch. in Southern Africa.

1. **Bergia odorata** Edgew. in Journ. As. Soc. Beng. 7 (1838) 765.

Shrubby, 15-60 cm., decumbent or spreading, glandular-pubescent; the bark deciduous in cinnamon-coloured flakes. Leaves subsessile, often fascicled in the axils, 2.5-20 mm. long, from oblong-lanceolate to elliptic, obtuse, crenate-serrate, hispid and often glandular on both sides, often with revolute margins; stipules linear. Flowers solitary or in axillary fascicles of 2 to 6 or 8; pedicels about as long as the sepals. Sepals ovate, acute, hairy without and on the margins. Petals obovate-oblong, entire. Stamens 10, alternately shorter or nearly equal; filaments dilated below. Ovary ovoid, sulcate, narrowed into the styles; styles 5, one-half the length of the ovary. Capsules

5-celled. Seeds minute, numerous, slightly curved, dark brown, shining.

Distribution: Sind, W. Rajputana, Gujerat.—Persia, Egypt, tropical Africa.

Used for cleaning teeth and, in Jodhpur, applied to broken bones. The leaves rubbed down in water are used as a poultice for sores (Macadam.)

Hadeija: Babargiwa—; *Porebunder:* Gangharan, Lavadiyun, Okharat—; *Rajputana:* Karbuja, Kakria, Rohwan—; *Sokoto:* Bushi—.

HYPERICACEAE.

Shrubs or herbs, rarely trees. Leaves opposite or rarely alternate, often marked with transparent or black dots, exstipulate. Flowers hermaphrodite, regular, solitary or cymose, terminal or rarely axillary, yellow red or white. Sepals and petals usually 5 each, free, imbricate, the petals contorted in bud. Stamens indefinite, free or variously combined into 3 or 5 bunches or rarely all connate. Ovary 3-5-carpelled, 1-or 3-5-celled; styles free or connate; ovules few or many on axile or parietal placentas, or rarely solitary and basal. Fruit capsular or baccate.—Species 210.—Temperate and warm regions.

Purgative, febrifuge, tonic, and astringent. They have balsamic resinous juices.

OFFICIAL:—*Hypericum ciliatum* Linn. (Portugal); *H. perforatum* Linn. (France)=*H. vulgare* G. Bauh. (Portugal).

HYPERICUM Tourn. ex Linn.

Herbs, shrubs or small trees. Leaves usually sessile. Flowers cymose, yellow, usually terminal. Sepals 5. Petals 5, usually somewhat oblique at the top. Ovary 1-celled with 3 or 5 parietal placentas or 3-5-celled with axile placentas; styles free or connate;

ovules usually many. Capsule septicidal or, when 1-celled, splitting through the placentas. —Species 220.—Chiefly temperate.

A. Sepals 5, unequal; petals deciduous; stamens 5-adelphous at the base; ovary 5-celled.
  1. A glabrous shrub, 30-90 cm. high .... 1. *H. patulum,*
  2. Stem none but branches innumerable .... 6. *H. chinense.*
B. Sepals 5, connate at the base, equal or unequal; petals persistent; stamens 3-adelphous at the base; ovary 3-celled.
  1. Styles twice the length of the ovary, equalling the stamens .... 2. *H. perforatum.*
  2. Styles very short .... 4. *H. sampsoni.*
  3. Styles half the length of the ovary .... 3. *H. humifusum.*
C. Sepals 5; petals persistent; stamens connate at the base; ovary 1-celled .... 5. *H. japonicum.*

Vulnerary, astringent, and anthelmintic. The seeds may be diuretic and antispasmodic.

The following are used medicinally:—in Europe—*H. androsaemum* Linn., *H. barbatum* Jacq., *H. coris* Linn., *H. elegans* Steph., *H. hircinum* Linn., *H. hirsutum* .Linn., *H. humifusum* Linn., *H. montanum* Linn., *H. perfoliatum* Linn., *H. perforatum* Linn., *H. pulchrum* Linn., *H. quadrangulum* Linn., *H. richeri* Vill., *H. tetrapterum* Fries.—; in Indo China— *H. ascyron* Linn., *H. chinense* Linn., *H. erectum* Thunb., *H. japonicum* Thunb., *H. patulum* Thunb., *H. sampsoni* Hance—; in Malaya—*H. japonicum* Thunn.—; In Southern Africa—*H. aethiopicum* Linn., *H. lalandii* Chois.—; in La Reunion—*H. angustifolium* Lam.—; in Madagascar —*H. japonicum* Thunb., in North America—*H. perforatum* Linn.—; in Brazil—*H. connatum* Lam., *H. laxiusculum* St. Hil.—.

OFFICIAL:—The flower tops of *H. ciliatum* Linn. (Portugal) and *H. perforatum* Linn. (rance)=*H. vulgare* G. Bauh. (Portugal)

1. **Hypericum patulum** Thunb. Fl. Jap. (1784) 295, t. 17.—*H. oblongifolium* Wall. Pl. As. Rar. t. 244 (non Choisy in Wall. Cat.).—PLATE 101B.

An erect evergreen shrub usually 0.6-1.2 m. high but attaining 1.8 m. with stem up to 5 cm. diam. Twigs slender, reddish, appearing somewhat 2-sided owing to the decurrent leaf-bases. Bark reddish brown, fairly smooth. Leaves 15-45 by 8-20 mm., elliptic-lanceolate, entire, acute or with a blunt point, base rounded or cuneate, lateral

nerves easily visible on the undersurface, dull dark green above, pale and somewhat glaucous beneath, distichous, sessile, the leaf-base decurrent and forming a raised line on either side of the shoot. Flowers 18-30 mm. diam., in few-flowered terminal cymes. Sepals 3.8-6 mm. long, elliptic or suborbicular, obtuse. Petals suborbicular. Styles about the same length as the ovary. Capsules 5-10 mm. long.

Distribution: Khasia Hills, 5,000—6,000 ft.; throughout the temperate Himalaya (except Sikkim), 3,000—7,000 ft., from Bhutan to the Ravi.—China, Formosa, Japan.

The scented seeds are employed as an aromatic stimulant in Patna, where they are imported from Nepal (Irvine).

In indo China they are used both externally and internally as a remedy for the bite of dogs and the sting of bees.

Bihari: Tumbhul—; *Indo China:* Kim ty mai—; *Lepcha:* Tumbomri—; *Nepal:* Urilo.—

2. **Hypericum perforatum** Linn. Sp. Pl. (1753) 785.—Plate 101A.

A perennial herb. Stems 30-60 cm., 2-angled. Leaves oblong, 8-25 mm., obtuse, veins pellucid, lower surface pale. Flowers 2.5 cm. diam., in terminal corymbs. Sepals narrowly lanceolate, acute, 6 mm., margins often black-dotted. Petals black-dotted on the margins. Stamens in 3 bundles, anthers black-dotted. Ovary 3-celled; styles 3, twice as long as the ovary. Capsule 8 mm.

Distribution: Temperate W. Himalaya, 6,000—9,000 ft.: Kashmir, Simla, apparently not in Kumaon.—N. temperate Asia, Europe, N. Africa.

The leaves have a sharp slightly bitter taste; stomachic, laxative, anthelmintic; good in earache and scorpion sting . . . bark diuretic; good for piles and uterine troubles (Yunani).

The herb is bitter and astringent, and recommended as a detersive, resolutive, anthelmintic, diuretic and emmenagogue and, externally as excitant.

It is recommended in Arabian medicine as a vermifuge, also used to cure piles, prolapsus uteri et ani.

The red juice is esteemed as one of the most popular and most curative applications in Europe for excoriations, wounds, and bruises.

An infusion of the herb is given beneficially for chronic catarrhs of the lungs, the bowels, or the urinary passages.

A salve compounded from the flowers is still much used and valued in English villages.

The flower tops are official in France and in Portugal.

The leaves are not an antidote to scorpion venom (Caius and Mhaskar).

Catalan: Herba foradada, Herba de San Joan, Hypericon—; *Danish:* Jordhumbe, St. Hans urt—; *Dutch:* St. Jans Kruid—; *English:* Amber, Balm of Warrior's Wound, Cammock, Devil's Scourge, Grace of God, Herb John, Hundred Holes, Lord God's Wonder Plant, Penny John, Perforated St. John's Wort, Rosin Rose, St. John's Grass, St. John's Wort, Terrestrial Sun, Touch & Heal, Witch's Herb—; *Finland:* Werdu heino—; *French:* Chasse diable, Herbe ă millepertuis, Herbe ă mille trous, Herbe aux piqûres, Herbe saint Jean, Herbe de la saint-Jean, Millepertuis, Millepertuis officinal, Trescalan, Trascalon perforé, Trucheron jaune, Truscalan—; *German:* Christiankraut, Christignadenkraut, Christikreuzblume, Christikreuzblut, Christiwundkraut, Christwundkraut, Conradskraut, Durchwachs, Elfenbeutkraut, Frauvonwurde, Gartheu, Harthau, Hartenan, Hartheu, Hasenkraut, Hexenkraut, Jagemichel, Jageteufelkraut, Johannesblume, Hohannesblut, Hohanneskraut, Hohannsinkrut, Kannsblut, Sankt Johanniskraut, Scharnokel, Schernekel, Tausendloch, Teufelsflucht, Teufelsraub,. Unsererliebenfrauenbettstroh, Urldgartheil, Wolfkraut—; *Hindi:* Bassant, Dendhu—; *Italian:* Cacciadiavoli, Iperico, Perforata, Pilatro—; *Languedoc:* Trescalan, Trescoulaou—; *Malta:* Pitted St. John's Wort, Cacciadiavoli, Erba di San Giovanni, Iperico—; *Polish:* Dziurawice—; *Portuguese:* Herva de San Joao, Hypericao, Milfurada—; *Provence:* Herbo de l'oli rougé, Herbo de la San-Jean..; *Punjab:* Bassant, Dendlu—; *Roumanian:* Iarba lui Sfant Ioan, Iarba sfantului Ioan, Pojarnita, Sunatoare—; *Russian:* Zweroboi—; *Spanish:* Corazoncillo, Yerba de San Juan—; *Swedish:* Johannisoert—; *Urdu:* Balsana—.

3. **Hypericum humifusum** Linn. Sp. Pl. (1753) 785.

A glabrous perennial herb, stems procumbent, 2-edged, about

15 cm. long, numerous, red. Leaves sessile, 6-13 mm., approximate, elliptic to ovate, pellucid-punctate and as well as the sepals with black intramarginal glands. Cymes terminal, few-flowered. Flowers 8-13 mm. diam. Sepals lanceolate unequal, styles half the length of the ovary.

Distribution: Nilgiris.—Europe, Atlantic Isles, S. Africa.

In Europe the flowers are infused in olive oil or in alcohol and used as a vulnerary, chiefly for old sores and eczema.

English: Trailing St. John's Wort—.

4. **Hypericum sampsoni** Hance in Seem. Journ. Bot. III, 378.

A perennial herb. Stems erect, cylindric, 30 cm. Leaves 3.8-5 cm., oblong, obtuse, connate pellucid-punctate, glaucescent beneath. Cymes lax; flowers 6-8 mm. diam. Sepals black-punctate, oblong obtuse. Petals about equalling the sepals. Styles very short. Capsule ovoid, covered with oval resinous vesicles.

Distribution: Khasia Mts.—S. China, Formosa.

In Tongking the plant is used as a vulnerary.

Indo China: Nguyen bao thao.

5. **Hypericum japonicum** Thunb. Fl. Jap. (1784) 295, quoad descr., excl. tab.

An annual herb, erect or procumbent; stem 15-30 cm. long, 4-angled, dichotomously branched above. Leaves 6-10 by 3-4.5 mm., amplexicaul, elliptic or ovate, obtuse at both ends, pellucid-punctate. Flowers 6-10 mm. across in elongate dichotomous cymes; pedicels 6 mm. long; bracts linear-lanceolate. Sepals lanceolate, acute, entire, persistent, pellucid-punctate at the margin. Petals yellow, as long as the sepals, persistent. Stamens not very numerous; filaments slightly connate at the base. Ovary 1-celled, with 3 parietal placentas; styles 3 (rarely 4), one-third the length of the ovary. Capsules ovoid, equalling the persistent sepals, 3-valved. Seeds oblong, ribbed.

Distribution: Temperate and subtropical Himalaya, Khasia Hills, Assam, Burma, E. and W. Peninsula, Ceylon.—Japan to Philippines, China, Java, Australia, New Zealand, Madagascar.

In China and Indo China the plant is credited with astringent and alternative action, and externally it is used as vulnerary.

In Madagascar the plant is used as a vulnerary, styptic, anti-asthmatic, and antidysenteric.

Betsimisaraka: Manitsorohina—; *Cantonese:* Thin Kee Wang—; *Chinese:* T'ien Chi Wang—; *Hova:* Anangoaika, Anantatara, Tsikotrakotra, Voantrotroka—; *Imerina:* Tsikotrokotroka—; *Indo China:* Ban—.

6. **Hypericum chinense** Linn. Syst. ed. X, II. 1184.—*H. monogynum* Linn. Sp. Pl. ed. II, 1107.

Stem none, but branches innumerable. Bark pretty smooth, brown. Leaves approximate, opposite, decussate, sessile, and nearly stem-clasping, horizontal, linear-oblong, obtuse, entire, smooth on both sides; from 2.5-5 cm. long. Stipules none. Flowers terminal, from one to so many as from a small umbel, short-peduncled, large, of a bright yellow. Calyx 5-leaved; leaflets smooth, oblong, green. Petals 5, obliquely wedge-formed as in the monodelphous flowers. Filaments from 30-50, in 5 bundles, nearly as long as the petals. Anthers oval, incumbent. Style single, as if composed of 5, being 5-grooved, as long as the stamens. Stigma 5-cleft. Capsules 5-carpellary, 5-celled, opening from the apex. Seeds many.

Distribution: China,—Cultivated in Indian gardens.

The plant is astringent and alterative. In Indo China the leaves and the green stems are made into a paste and applied to bites from dogs and stings from bees.

Indo China: Kim ty dao—.

GUTTIFERAE.

Trees or shrubs with yellow or greenish juice. Leaves opposite or, rarely, verticillate, usually coriaceous and exstipulate. Flowers solitary or in axillary or terminal fascicles racemes or panicles, white

yellow or red, regular, dioecious polygamous or hermaphrodite. Sepals and petals 4-12, imbricate in 2-3 series. Male: Stamens usually indefinite; filaments 1-6-adelphous or quite free. Female: Staminodes numerous, free or connate. Ovary 1-2- or many- celled; style 1 usually short or 0, or rarely styles 2; stigmas free or connate, often peltate, as many as the cells; ovules 1 or 2 or many, axile, basal or rarely parietal. Fruit usually indehiscent and baccate, occasionally capsular. Seeds large; albumen 0; embryo with large radicle and small cotyledons or *vice versa.*—Genera about 40. Species about 630.—Chiefly tropical.

A. Ovary-cells 1-ovuled; stigma sessile or subsessile, peltate, entire or with radiating lobes; berry indehiscent.
    1. Calyx of 4 or 5 sepals .... GARCINIA.
    2. Calyx closed in bud, bursting in 2 valves .... OCHROCARPOS.
B. Ovary with 1, 2, or 4 erect ovules; styles slender (rarely styles 2); stigma peltate or 4-fid or acute; fruit fleshy, rarely dehiscent.
    1. Ovary 1-celled, 1-ovuled, style 1, stigma peltate .... CALOPHYLLUM.
    2. Ovary 2-celled, 4-ovuled, style 1, stigma peltate .... MESUA.

The members are the source of gum-resins endowed with emetic and cathartic properties. The seeds are mostly oleaginous and the oils and fats are used medicinally. Some of the barks are diuretic. The rind of the fruit may be astringent.

Among the gum-resins gamboge may be mentioned as containing α—, β—, and γ-garcinolic acids.

An essential oil was found to consist of terpene and camphor.

Cambogin, a toxic resin, has been obtained from *Garcinia cambogia* Desr.

OFFICIAL:—*Garcinia spp.* (Belgium, Germany, Turkey); *G. Hanburyi* Hook. fil. (Austria, Belgium, France, Germany, Italy, Sweden, Turkey, United States)=*G. Morella* var. *pedicellata* Hanbury (Switzerland); *G. morella* Desr. (Spain) var. β *-pedicellata* Desrousseaux=*Hebradendron cambogioides* Graham (Portugal); *G. pedicellata* Seem. (Spain).

GARCINIA Linn.

Trees or shrubs, often with yellow juice. Leaves coriaceous, sometimes only thinly so; stipules usually 0. Flowers solitary

fascicled umbelled or panicled, polygamous or dioecious. Sepals 4-5. Petals 4-5, imbricate. Male: stamens numerous, free or combined into a ring or an entire or 4-5-lobed mass, often surrounding a rudimentary ovary; filaments short and thick or 0; 2- or 4- celled anthers straight horseshoe-shaped or annular, dehiscence longitudinal or circumsciss. Female: Staminodes free or connate in groups. Ovary 2-12-celled; stigma subsessile, peltate lobed or entire, smooth or tubercled; ovules solitary on the inner angle of each cell. Berry with tough rind enclosing several large seeds enclosed in a pulpy aril.—Species 200.—Palaeotropic.

A. Sepals and petals 4 each Stigma divided into rays or deeply 4-lobed.
   I. Stamens of male flowers in 4 masses or in a 4-lobed mass surrounding the rudimentary ovary; anthers oblong, dehiscing vertically.
      a. Leaves 15-25 cm. .... 1. *G. mangostana.*
      b. Leaves 10-15 cm. .... 6. *G. cornea.*
   II. Stamens of male flower in a central shortly-stalked 4-angled or columnar mass; anthers quadrate, dehiscing vertically; rudimentary ovary usually absent.
      Male flower in 3-∞ -flowered, terminal and axillary fascicles; fruit subglobose or ovoid, tip mamillar.
      a. Leaves 6.3-9 cm. .... 2. *G. indica.*
      b. Leaves 7.5-12.5 cm. .... 7. *G. cowa.*
   III. Stamens of the male flowers in a subglobose mass; anthers adnate, orbicular, dehiscence circumsciss, rudimentary ovary absent.
      a. Leaves 10-15 by 3.8-7.5 cm. .... 3. *G. morella.*
      b. Leaves 15-20 by 7.5-10 cm. .... 8. *G. heterandra.*
B. Sepals and petals 5, very rarely 4; filaments connate in 5, rarely 4 erect distant pedicelled spathulate bodies, antheriferous at the top, free portions very short.
   I. Leaves 23-45 by 5-10 cm. long .... 4. G. *xanthochymus.*
   II. Leaves 12.5-25 cm. long .... 5. *G. dulcis.*

Astringent properties are met in the bark and in the rind of the fruit of some species. The gum-resins are powerful, drastic cathartics.

The following are used medicinally:—in China—*G. mangostana* Linn., *G. morella* Desv.—; in Indo China—*G. cambodia* Desr., *G. hanburyi* Hook. f., *G. mangostana* Linn.—; in Cambodia—*G. harmandii* Pierre, *G. lanessanii* Pierre, *G. mangostana* Linn., *G. olivieri* Pierre, *G. vilersiana* Pierre—; in Malaya—*G. dulcis* Kurz.,

G. mangostana Linn.—; in the Philippine Islands—*G. cambodia* Desr., *G. mangostana* Linn., *G. spicata* Hook. f., *G. venulosa* Chois.—; in New Caledonia—*G. corallina* Vieil.—; in the Gold Coast *G. guineensis* Willd.—; in Nigeria—*G. conrauana* Engl.—; in Southern Africa—*G. livingstonii* T. And.

OFFICIAL:—The gum-resins of *Garcinia spp.* (Belgium, Germany, Turkey); *G. Hanburyi* Hook f. (Austria, Belgium, France, Germany, Italy, Sweden, Turkey, United States)=*G. Morella* var. *pedicellata* Hanbury (Switzerland); *G. morella* Desr. (Spain) var. *β-pedicellata* Desrousseaux=*Hebradenron cambogioides* Graham (Portugal); *G. pedicellata* Seem. (Spain).

1. **Garcinia mangostana** Linn. Sp. Pl. (1753) 635.—PLATE 102.

A tree about 6-9 m. tall. Bark smooth. Leaves thickly coriaceous, elliptic-oblong, acute, base cuneate, deep shining green; nerves numerous, inarching with a double extra-marginal nerve, 15-25 cm. long, 6.3-10.5 cm. wide; petioles 20-25 mm. long. Female flowers 5 cm. across, solitary or paired at the ends of branches, on stout 1.3 cm. long pedicels. Sepals 4, rounded, yellowish. Petals 4, ovate, dark rosy pink, larger. Stamens 15-20, all free, slender with small elliptic white anthers, all abortive. Ovary globular, 4- to 8- celled. Stigma sessile, 4- to 8- rayed, yellow. Fruit depressed, globular, 7.5 cm. through, deep brown crimson, rind thick, rose pink within. Seeds 6-8, enclosed in a white juicy aril.

Distribution: Cultivated on the W. Coast of the Madras Presidency, Nilgiris, Goa, very rarely in the Bombay Presidency.

The rind is used as an astringent medicine for diarrhœa and dysentery. It has been found very useful in chronic diarrhœa in children by Waring and others.

It has also been used as a febrifuge.

In Cambodia, the bark of the plant and the rind of the fruit are used in diarrhœa and dysentery as astringents.

According to Rumphius, the bark and young leaves are employed by the Macassars in diarrhœa, dysentery and affections of the genito-urinary tracts, and also as a wash for aphthae of the mouth.

A strong decoction has also been recommended as an external astringent application.

The powdered rind of the dried fruit in daily doses of 60-120 grains dispensed in 3-4 portions gave satisfactory results in 63.8 per cent of amoebic—36 treated—, and 66.6 per cent cases of non-amoebic—15 treated—dysentery, and in 72.0 per cent cases of diarrhœa other than dysentery—45 treated—. Mangostin was extracted from the dried rind and tried clinically. It was found to be very inferior to the powdered rind as an antidiarrhœal agent (Caius and Mhaskar).

Bengal: Mangustan—; *Bombay:* Mangostin, Mangustan—; *Burma:* Mangkob, Mengkop, Mengut, Mimbu, Mingut, Youngzalai—; *Chinese:* Shan Chu Kuo, Tu Nieu Tzu—; *English:* Mangosteen—; *French:* Mangoustan cultivé—; *Hindi:* Mangustan—; *Indo China:* Mang cut, Mung khut—; *Jolo:* Manguis—; *Malaya:* Manggis, San chook hok—; *Malayalam:* Manggusta, Sulampuli—; *Marathi:* Mangastin—; *Portuguese:* Mangosta—; *Sinhalese:* Mangus—; *Spanish:* Mangostan, Mangostan de la India—; *Tamil:* Sulambuli—.

2. **Garcinia indica** Chois. in DC. Prodr. I (1824) 561.—*G. purpurea* Roxb. Fl. Ind. II, 624.—*Brindonia indica* Dupetit-Thouars in Dict. Sc. Nat. V, 340.—Plate 103.

A small tree. Leaves 6.3-9 by 2.5-3.8 cm., red when young, oblong-lanceolate, glabrous with entire, repand margins; petioles 6-9 mm. long. Flowers axillary or terminal, solitary or in spreading fascicles; pedicels gradually thickened upwards, 4-8 mm. long or 0; bracts scale-like, deciduous. Sepals 4.5 mm. long, decussate, thick and fleshy; outer smaller, oblong-ovate; inner larger obovate-orbicular. Petals 4, thick, a little longer than the sepals. Male flowers 3-8, in axillary and terminal fascicles, the pedicles of the terminal fascicles carried on a short peduncle. Stamens very numerous, on a short column; anthers 2-celled, dehiscing longitudinally; filaments very short. Female flowers sessile or very shortly pedicelled, solitary or 2-3 together, the fascicles not peduncled. Staminodes in 4 bundles, arranged crosswise, each bundle containing 2-7 staminodes in one or more rows; filaments short, very thick. Ovary 4-8-celled; stigma

sessile, with as many lobes as the cells. Fruit globose, not furrowed, 2.5-3 cm. diam., purple throughout. Seeds 5-8, compressed embedded in pulp.

Distribution: Konkan, N. Kanara, Goa, W. Ghats of Bombay, S. Kanara, Coorg, Wynaad, often cultivated.

The raw fruit is hot and sour; destroys "vata;" promotes "kapha" and "pitta."— The ripe fruit is hot, sour, sharply acrid; difficult to digest, causing constipation; improves appetite and allays thirst; anthelmintic, cardiotonic; useful in bleeding piles, dysentery, tumours, pains, and heart diseases (Ayurveda).

The Apothecaries of Goa prepare a very fine purple syrup from the juice of the fruit, which is used in bilious affections. The bark is astringent, and the young leaves, after having been tied up in a plantain leaf and stewed in hot ashes, are rubbed with cold milk and given as a remedy for dysentery.

The oil of the seeds is much used for the preparation of ointments, suppositories and other pharmaceutical purposes. It has been used as a local application to ulcerations, fissures of the lips, hands, etc., by partly melting it and rubbing on the affected part.

OL. GARCINIAE PURPUREAE GUTTIFERAE, native name =*Kokam cha-tel.*—This Kokam butter, as it is called, is obtainable in the local market and has been used at this Depot for many years past in the manufacture of Unguent. Hydrarg. Nitratis. Equal parts of the butter and Indian lard are used as the basis (The Medical Storekeeper to Government, Bombay Command; 1896).

Bombay: Kokam—; *Canarese:* Dhupadamara, Murgala, Murginahali, Tittidika—; *Deccan:* Kokamb, Ratambi—; *English:* Wild Mangosteen—; *Goa:* Brindao, Brindoeiro—; *Gujerati:* Kokan—; *Hindi:* Kokam—; *Konkani:* Birondd, Birondi, Ratambi—; *Malayalam:* Punampuli—; *Marathi:* Amsole, Bhirand, Chirand, Katambi, Kokam, Ratamba—; *Sanskrit:* Amlabija, Amlapura, Amlashaka, Amlavriksha, Amlavrikshaka, Atyamla, Bijamla, Chudamla, Chukra, Chukramla, Chukraphala, Phalamlaka, Puramla, Raktapuraka, Rasamla, Shakamla, Shreshthamla, Tintidika, Tittidiphala, Vrikshamla—; *Tamil:* Murgal—; *Tulu:* Puranapuli—.

3. **Garcinia morella** Desrous. in Lam. Encyc. III (1789) 701. —*G. pictoria* Roxb. Hort. Beng. (1814) 42; Fl. Ind. 627; Wight Ic. t. 102.—*G. Gutta* Wight Ill. I, 126.

A middling sized tree, with spreading branches, quite glabrous; young branches quadrangular, smooth. Leaves 7.5-12.5 by 3.8-6.3 cm., elliptic-obovate to ovate-lanceolate, subacute or shortly and bluntly acuminate, narrowed at the base; petioles 6 mm. long. Male flowers axillary, in fascicles of 2-5, subsessile, or on pedicels 4-6 mm. long. Sepals 4, decussate, orbicular, concave, the outer the smaller. Petals 4, a little larger than the sepals. Stamens 25-40, monadelphous, the filaments combined into a subquadrangular central column, but free at the apex, the free portion very short; anthers orbicular, flattened, dehiscing transversely. Rudimentary ovary 0. Female flowers larger than the male, solitary, axillary, usually sessile. Sepals and petals as in the male, the former persistent, the latter deciduous. Staminodes 18-30, in a ring round the ovary, connate at the base. Ovary globular, smooth, 4-celled; stigma peltate, irregularly lobed and tubercled. Fruit 2 cm. diam., subglobose, surrounded at the base by the persistent sepals, glabrous. Seeds 4, ovoid-reniform, slightly compressed; testa muriculate, dark brown.

Distribution: E. Bengal, Khasia Hills, evergreen forests of N. Kanara, W. Ghats from S. Kanara and Mysore to Travancore, up to 3,000 ft., Ceylon.—Malacca, Singapore, Siam.

Gamboge is acrid and sweetish; tonic, aphrodisiac, cholagogue; removes burning inflammations due to "kapha" and "pitta" (Ayurveda).

The gamboge is considered a valuable hydragogue cathartic. It also possesses anthelmintic properties. It is used in dropsical affections, amenorrhœa, obstinate constipation, and as a vermifuge.

The stem rubbed with water is a household remedy as a local application to rising pimples and boils, and often cuts them short.

The seeds contain 30 per cent of fat. Its component fatty acids and glycerides were determined by Dhingra and Seth (20th Ind. Sc. Congress; Patna, 1933).

Madyar Gopal Rao has isolated from the husks an orange crystalline colouring matter, morellin (13th Ind. Sc. Congress;

invigorating, alexipharmac; destroys "tridosha"; binding; good in heart complaints, and biliousness (Ayurveda).

The fruit, which is yellow and of the size of a small apple and very acid, sweetish when ripe, edible, is used for the same purposes as that of *G. indica;* it is dried and made into a kind of Amsul. A sherbet made with about 1 oz. of the Amsul, with a little rock-salt, pepper, ginger, cumin and sugar, is administered in bilious conditions.

Assam: Tepor, Tezpur, Tihur—; *Bengal:* Chalate, Tamal—; *Bombay:* Dampel, Onth, Osth—; *Burma:* Madau, Matau—; *Canarese:* Devangi, Deavkai, Devagarige, Devajarige, Gansargi, Gurse, Hirekanigu, Janagi, Javangi, Neralemavu—; *Ceylon:* Egg-tree, Simaigoraka—; *Coorg:* Divarige, Nelamavu, Vate—; *Garo:* Manhola—; *Gujarat:* Karamala, Ota—; *Hindi:* Dampel, Ota, Tamal—; *Kadir:* Anavaya—; *Konkani:* Dharambe—; *Marathi:* Jharambi, Ota—; *Sanskrit:* Avika, Bhavana, Bhavishya, Bhavya, Kalakhanda, Kusumodar, Lamphala, Pichchalabija, Samputanga, Tamala, Tapinjha, Vakrashodana—; *Saora:* Lollorimanu—; *Sinhalese:* Cochingoraka, Ratagoraka—; *Tamil:* Kulavi, Malaippachai, Malaippuli, Pachilai, Pachumbadi, Tabinjam, Tamalam—; *Telugu:* Ivarumamidi, Sikatimramu, Sitakamraku, Tamalamu—; *Tulu:* Jarige—.

5. **Garcinia dulcis** Kurz For. Fl. Burma I, 92.—*Xanthochymus dulcis* Roxb. Corom. Pl. t. 27; Wight Ic. t. 270.

Medium tree, 6-12 m. tall. Branchlets 4-angled, yellow. Leaves deep green coriaceous ovate-oblong, shortly acuminate, base rounded; nerves 10 pairs, inarching near edge, not very prominent, 12.5-25 cm. long, 4.5-11.5 cm. wide; petioles 10-15 mm. long, stout. Flowers globular, hardly expanding, 6 mm. across, greenish yellow, unisexual or male and bisexual mixed, in dense many-flowered fascicles in the leaf-axils; pedicels 6-9 mm. long, Sepals 4-6, orbicular, 3 outer smaller. Petals usually 5, larger. Stamens 40 in pedicelled fan-shaped groups. Disc in male corrugated, fleshy, in female 5-lobed. Stigma in males 0, in bisexuals, 5-rayed. Fruit 6.3-7.5 cm. long, globular, ovoid or pear-shaped, peduncled, pulpy, yellow. Seeds 1-5, oblong.

Distribution: Malay Peninsula, Malay Islands.

The oily seeds are sold in the drug shops of Malaya as a remedy for dysentery and chronic diarrhoea.

Malay: Bijimundu, Mundu—.

6. **Garcinia cornea** Linn. in Murr. Syst. ed. XIII, 368; Wight Ic. t. 105.

An evergreen tree, all parts glabrous; bark about 6 mm. thick, receding in convex pieces; cut milky, the milk soon yellow. Leaves broadly oblong to oblong-lanceolate, acute at base, rather long-petioled, 15-18 cm. long, shortly and bluntish acuminate or apiculate, coriaceous, glabrous. Flowers nearly 2.5 cm. diam., pale yellow, the males on 6-8 mm. long peduncles and terminal by 3 to 9, the females sessile, solitary and terminal; males: stamens numerous, almost sessile on a fleshy 4-lobed mass; abortive style terminated by a large sticky yellow gland; females: stamens none; ovary ovate, 4-or 6- celled; style very short and thick; stigma large and flat, 4-or 6- lobed, covered by sticky glands. Berry nearly oval, the size of a pigeon's egg, somewhat tapering at apex, dark purple, containing 4-6 seeds in a pleasantly subacid white pulp; stigma large, peltate.

Distribution: E. Bengal to Tenasserim.—Malay Archipelago.

The tree yields an inferior kind of gamboge used medicinally in Burma.

Lepcha: Taksalkung—.

7. **Garcinia cowa** Roxb. Fl. Ind. II (1832) 622.

An evergreen middling sized dioecious tree, all parts glabrous. Leaves broadly to elliptically lanceolate, at both ends acuminate, 4-6 mm. long, the lateral nerves irregular and apparently strongly prominent. Flowers rather small, yellow, the male ones smaller (about 8 mm. across), rather slenderly pedicelled in dense terminal clusters, the females 13 mm. diam. or somewhat larger, pedicelled, solitary, or by 3-5 at the end of the branchlets; sepals concave-oval, 4-6 mm. long; petals in males about so long as the sepals, in the females somewhat longer and larger; males: anthers numerous, 4-cornered-oblong, 4-celled, on very short filaments, crowded on the 4-cornered fleshy staminal mass: ovary rudiment minute; females: staminodes forming

5 or 10 connate filaments ending into a gland and forming an interrupted ring round the ovary; stigma stellately and densely 6-8-lobed, the lobes crenate. Berry the size of a lime, slightly 6-8-lobed, but not truly torulose, dull red, somewhat depressed at the apex, and here bearing a small sessile deeply 6-8-cleft stigma, the mesocarp reddish yellow.

Distribution: E. Bengal, Assam, E. Peninsula, Andaman Islands.

The gum-resin is used medicinally by Burman practitioners.

Bengal: Kau—; *Burma:* Madow, Taungthale, Toungdalai—; *Hindi:* Cowa—; *Nepal:* Kaphal—.

8. **Garcinia heterandra** Wall. Cat. 4856.

Young branches stout, with large axillary flowering nodes. Leaves 15-20 by 7.5-10 cm., thickly coriaceous, ovate obtuse or obtusely acuminate, base tapering; veins 1.3-2.5 cm. apart, faint, curved; petiole 2-2.5 cm., stout. Male flowers 8 mm. diam., axillary, sub-sessile. Sepals thin, coriaceous, orbicular. Petals thick, fleshy twice as long as the sepals. Stamens in a globose central mass, free portions of filaments very short; anthers peltate. Female flowers axillary, solitary, sessile. Immature fruit subglobose, 4-celled, 4-seeded stigmatic rays 4, sessile, tubercled.

Distribution: Pegu and Tenasserin up to 4,000 ft.

The gum-resin is occasionally, though not extensively employed as a medicine by Burman native practitioners (Mason).

Burma: Thanatdau, Thanattau—.

Ochrocarpos Thou.

Trees. Leaves coriaceous, opposite, or ternately whorled. Flowers in short cymes or lateral or axillary fascicles, polygamous. Calyx closed before flowering, at length opening valvately into 2 sepals. Petals 4 or more. Stamens indefinite; filaments filiform, free or shortly connate below; anthers erect, oblong, 2-celled, dehiscing longitudinally. Ovary 2-celled; ovules 2 in each cell; style short, stout or 0; stigma 3-lobed. Berry 1-4-seeded. Seeds large, enclosed

in pulp; embryo of a large fleshy tigellus with the cotyledons reduced to a small mammilla or O.—Species 10.—Palaeotropics.

Stimulant, carminative, astringent.

O. pentapetalus Blanco is used medicinally in the Philippine Islands, *O. harmandii* Pierre in Indo China, and *O. africanus* Oliv. in the Gold Coast.

1. **Ochrocarpos longifolius** Benth. & Hook.f. ex T. Anders. in Fl. Brit. Ind. I (1874) 270.—PLATE 105.

A large tree; young shoots terete or slightly 4-gonous. Leaves thickly coriaceous, 15-20 by 5-6.3 cm., oblong, obtuse or shortly and bluntly pointed, quite glabrous, with slightly repand margins and prominent midrib, base rounded, veins inconspicuous in fresh, but beautifully reticulate in dried specimens; petioles 6 mm. long, stout. Flowers numerous, in short fascicles on tubercles from the axils of fallen leaves; buds globose, apiculate, orange-red; pedicels 1.2-2 cm. long, thickened upwards; bracts numerous subulate. Calyx bursting into 2 valves, reflexed during flowering. Petals 4 ovate-oblong, acute, thin, deciduous, white streaked with red. Stamens many, sterile in the female flowers. Style short, stout; stigma broad, peltate. **Fruit** 2.5 cm. long, obliquely ovoid, tipped by the hard, pointed style, 1-seeded.

Distribution: W. Ghats of the Konkan, N. Kanara, Malabar and Coimbatore; cultivated in the N. Circars.

The flowers are fragrant, sweet, cooling, analgesic, stomachic, aphrodisiac; destroy "kapha," dispel biliousness; good in blood diseases, leprosy (Ayurveda).

The flower-buds possess astringent and aromatic properties.

The flowers are stimulant and carminative. They are useful in some forms of dyspepsia and in haemorrhoids. (Moodeen Sheriff).

Bengal: Nagakesar Punnangachcha, Rajachampaka—; *Bombay:* Suringi, Tambranagkesar—; *Canarese:* Gadhavunate, Phatapale, Punay, Puniye, Punnaga, Suragi, Surgi, Surungi, Unate, Wundy—; *Deccan:* Gardundi—; *Gujarat:* Punnaga, Ratinagkesar, Surapunnaga—; *Hindi:* Nagkesar, Pulaka, Punnaga, Sultanachampaka—;

Konkan: Ranundi, Suringi, Surong, Surongi—; *Malayalam:* Surampunna—; *Marathi:* Godiyundina, Punnag, Suringi, Undali—; *Sanskrit:* Aruma, Devavallabha, Kamboge, Kesari, Keshara, Keshava, Kumbhika, Nagakeshara, Nagapushpa, Pandunaga, Pataladruma, Punnaga, Purusha, Purushakhya, Raktakeshara, Raktapushpa, Raktarenu, Raktavriksha, Surangi, Tunga—; *Tamil:* Surabunnagam, Surabunnai, Valai—; *Telugu:* Suraponna, Surapunnagamu—; *Uriya:* Surongo—.

CALOPHYLLUM Linn.

Trees. Leaves coriaceous, shining, striately penninerved. Flowers polygamous, in axillary or terminal panicles. Sepals and petals 4-12, imbricate in 2-3 series. Stamens indefinite, free or scarcely connate at the base; filaments filiform; anthers erect, ovate or oblong, 2-celled, dehiscing longitudinally. Ovary 1-celled; ovule 1, erect; style rather long; stigma peltate. Drupe indehiscent; putamen crustaceous. Seed erect, ovoid or globose; testa thin, or thick and spongy.—Species 80.—Tropical, chiefly Old World.

1. Leaves 10-20 by 7.5-10 cm., petiole 3.8-3.2 cm. .... 1. *C. inophyllum.*
2. Leaves 7.5-12.5 by 3.2-5 cm.; petiole 13-20 mm. .... 3. *C. elatum.*
3. Leaves 5-10 by 3.2-5 cm.; petiole 4 mm. .... 2. *C. apetalum.*

The resin is emetic and cathartic; the bark is diuretic.

The following species are used medicinally in China, Indo China, and the islands of the Indian Ocean—*C. inophyllum* Linn.—; in Madagascar—*C. laxiflorum Drake, C. parviflorum* Bojer., *C. tacamahaca* Willd.—; in the Antilles—*C. calaba* Jacq.—; in Brazil—*C. brasiliense* Camb.—.

1. **Calophyllum inophyllum** Linn. Sp. Pl. (1753) 513.—PLATE 106.

A very handsome, small or middle-sized glabrous tree, with a crooked trunk; bark grey, smooth. Leaves 10-18 by 7.5-10 cm., broadly elliptic, rounded at the apex, often emarginate, with subrepand waved margins and very close lateral nerves, giving a striate appearance to the blade, base acute; petioles 9-15 mm. long, stout, flat. Flowers 1.9-2.5 cm. diam., pure white, fragrant, in lax few-flowered racemes 10-15 cm. long. Sepals 4, ovate-orbicular, concave,

reflexed, ciliolate, the two outer much the smaller. Petals 4, oblong, obtuse, spreading. Stamens numerous; filaments united into 4-6 bundles. Style long, twisted; stigma large, mushroom-shaped. Fruit globose, 2.5-3.8 cm. diam., smooth, yellowish; pulp scanty.

Distribution: Along the E. and W. coasts of the Peninsula, Burma, the Andamans and Malay Peninsula, Ceylon. Essentially a littoral species.—E. African Islands, Malaya, Australia, Polynesia.

Bark hot with a sharp taste; heals ulcers and inflammation of the eye; destroys "kapha" and "vata;" lessens appetite; astringent; improves the complexion (Ayurveda).

The bark is astringent and useful in internal haemorrhages. The juice is used as a purgative, and is said to be very powerful in its action.

The tears which distil from the tree and its fruit are emetic and purgative (Rheede).

The gum which flows from the wounded branches, mixed with strips of the bark and leaves, is steeped in water, and the oil which rises to the surface is used as an application to sore-eyes. It is said to be a useful remedy for indolent ulcers.

In Cambodia the leaves are prescribed as an inhalation in migraine and vertigo. The oil from the kernels of the seeds is used in scabies.

The leaves soaked in water are employed as an application to inflamed eyes, in the Archipelago.

In Madagascar the leaves are applied to sore eyes; the pounded bark is used topically in orchitis; the gum resin is considered vulnerary, resolvent, and anodyne; the oil from the seeds is a reputed antipsoric, and is much used in the treatment of rheumatism; a decoction of the root is used in dressing ulcers.

In New Caledonia the gum resin is applied to ulcerous wounds.

The fixed oil, expressed from the kernels of the seeds, is said to cure scabies. It exercises a great beneficial influence over the mucous membrane of the genito-urinary organs, and is therefore highly useful in the treatment of gonorrhoea and gleet. Externally, it is a good and useful embrocation in rheumatism and gout. The watery paste of the kernel of the seeds, applied to the painful joints and dried by

the heat of fire, often affords a great relief in the same diseases, and may be resorted to in the absence of the oil.

In Java the tree is supposed to possess diuretic properties.

The oil is excellent for soap making. The residual cake is bitter and, therefore, suitable for use as a manure (Bull. Imp. Inst. 1913).

A preliminary examination of the oil has been carried out by H. W. Patwardan (18th Ind. Sc. Congress; Nagpur, 1931).

Bengal: Punnag, Sultanachampaca—; *Betsileo:* Foraha—; *Betsimisaraka:* Foraha—; *Bicol:* Dancalan—; *Bombay:* Udi, Undi—; *Burma:* Pengnyet, Phounniya, Phungnyet, Ponnyet—; *Cambodia:* Kchyuong—; *Canarese:* Honne, Huhonne, Nameru, Ponne, Surahonne, Vuma—; *Ceylon:* Dommakkottai—; *Chinese:* Hu T'ung Lei—; *Cutch:* Udi—; *Deccan:* Surfan, Surpanda, Undi—; *English:* Alexandra Laurel, Alexandrian Laurel—; *Fiji:* Dilo—; *Hindi:* Sultanachampa, Surpan, Surpunika, Undi—; *Hova:* Tsindelo —; *Ilocano:* Bitaog, Bitog, Pamitaoguen, Pamitlaten—; *Indo China:* Ho dong, Mu u—; *Konkani:* Unddi—; *Madagascar:* Vintanina—; *Malaya:* Betan, Bintangor lunga, Penaga laut, Pudik—; *Malayalam:* Pouna, Punna—; *Marathi:* Nagchampa, Pumag, Surangi, Undag, Undela, Undi, Wundi—; *New Caledonia:* Pit, Tamanu, Vara—; *Oceania:* Ndilo—; *Pampangan:* Bitaog, Palomaria—; *Philippines:* Birog, Bitoc, Dingcalin, Palomaria de playa, vitam—; *Sanskrit:* Nagachampa, Nameru, Punnaga, Purasakeshara, Surangi, Tungakeshara—; *Seychelles:* Takamaka—; *Sind:* Duggerphul, Dugurphort, Purraya, Purreya, Surangi, Undi—; *Sinhalese:* Domba, Dombagaha, Dombagass, Dombatel, Teldomba—; *Tagalog:* Bancalan, Bitanhol, Dancalan, Dincalin, Palomaria, Tamauian—; *Tahiti:* Tamanu—; *Taimoro:* Voakotry—; *Tamil:* Nagam, Nameru, Pinmai, Punnagam, Punnai—; *Telugu:* Nameru, Pouna, Punnaga—; *Tongking:* Cay mu hu—; *Tulu:* Ponne—; *Uriya:* Polang, Punang, Punnango—; *Visayan:* Bitaog, Dancalan—; *Zambales:* Bitaoi—.

2. **Calophyllum apetalum** Wild. in Ges. Naturf. Fr. Berlin Mag. (1811) 79 (excl. strip. zeyl.).—*C. decipiens* Wight Ill. (1840) 128; Ic. t. 106; Dunn in Gamble Fl. Madras I (1915) 76.—*C. Wightianum* Wall. Cat. 4847 (1831), nomen. T. Anders. in Hook.f.

Fl. Brit. Ind. I (1874) 274.—PLATE 107 (under *C. Wightianum* Wall).

A middle-size tree, with yellowish bark; young shoots 4-gonous, glabrous. Leaves coriaceous, 5-9 by 2.5-3.8 cm., obovate-oblong, cuneate, rounded at the apex, often emarginate, with close nerves most prominent on the lower surface; petioles 6 mm. long. Flowers 12 mm. diam., in racemes from the upper axils; bracts small, boatshaped, caducous; pedicels slender, 12 mm. long. Sepals 4, strongly veined, subequel, deflexed, the two outer orbicular, the two inner boat-shaped. Petals O. Stamens numerous, many-seriate; anthers large. Style flexuous; stigma peltate with crenulate margin. Fruit 2 cm. long, ellipsoid, smooth, apiculate, red when ripe.

Distribution: W. Ghats of the Bombay Presidency, and from Mysore to Travancore up to 1,000 ft., banks of rivers and backwaters on W. coast from N. Kanara southwards.

The resin acts as a vulnerary resolutive and anodyne.

The oil obtained from the seeds is used as medicine in leprosy and cutaneous affections, and in infusion, mixed with honey, in scabies and rheumatism.

Bombay: Cherupinnai, Sarapuna—; *Canarese:* Bobbe, Bobbi, Irai, Iria, Kalhonne, Kirihonne—; *Marathi:* Bobbi, Irai—; *Tamil:* Sirubinnai—; *Travancore:* Attupunna, Kattapunna, Mannapunna, Purapunna, Serupunna—; *Tulu:* Kaiponne, Kalponne, Seruponne, Siriponne—.

3. **Calophyllum elatum** Bedd. Fl. Sylv. t. 2.—*C. tomentosum* Cooke Fl. Bomb. Pres. I, 80. (non Wight).

A tree, attaining a great height; young shoots, buds and panicles clothed with rusty tomentum; young branches quadrangular. Leaves coriaceous, 7.5-12.5 by 3.2-5 cm., oblong-lanceolate, acuminate, acute at the base, glabrous, shining; nerves very fine equally conspicuous on both surfaces; petioles 1.3-2 cm. long, stout, pubescent, at length glabrous. Flowers 1.3-2 cm. diam., in terminal panicles, and in racemes or panicles from the axils of the upper leaves; pedicels long, slender, tomentose. Sepals 4, the outer orbicular, much shorter than the inner, ciliolate. Petals 4, oblong, obtuse, spreading, exceeding the sepals. Stamens numerous; filaments

pure white, spreading, obovate-cuneate, with crisped and undulate margins often torn. Stamens very numerous, golden-yellow, much shorter than the petals, slightly united at the base into a fleshy ring; anthers oblong. Style twice as long as the stamens; stigma peltate. Fruit 2.5-3 cm. long, ovoid with a conical point, surrounded by the enlarged sepals; pericarp tough, semi-woody, at length 2-valved. Seeds 1-4, angular, smooth, chestnut-brown.

Distribution: Mountains of E. Himalaya and E. Bengal, Assam, Tenasserim, Burma, Andamans, evergreen rain-forests of N. Kanara and S. Konkan, forests of the W. Ghats from S. Kanara to Travancore, up to 5,000 ft., Ceylon.

Hot, dry, easy to digest, digestive, alexipharmac; good for fevers, sweats, biliousness, foul breath, scabies, skin eruptions, itching, small tumours, headache, blood and heart troubles, sore throat, cough, hiccough, vomiting, thirst, dysentery, and bleeding piles (Ayurveda).

Sweetish, carminative, binding, cardiotonic; good in asthma and sweats; cures ulcers and piles (Yunani).

The leaves and flowers in combination with other drugs are recommended for the treatment of snake bite (Charaka, Sushruta, Vagbhata, Sharangdharsamhita) and scorpion sting (Charaka, Sushruta).

The bark is mildly astringent and feebly aromatic. Combined with ginger it is given as a sudorific.

The flowers are astringent and stomachic. In many localities they are used for cough, especially when attended with much expectoration. A paste made of the flowers with butter and sugar is used in bleeding piles and burning of the feet.

The flowers and leaves are used in Bengal as an antidote to snake poison.

In North Canara the oil of the seeds is used as an embrocation in rheumatism, and found useful in the treatment of itch.

The oil is useful in soap making (Bull. Imp. Inst., 1913).

The unripe fruits of this plant are aromatic and sudorific. The flower buds are used in dysentery. A syrup of flower buds 1 in 10 was used in acute cases of dysentery in the out-patient department; mild cases were cured by its use, but in very acute and severe cases, it was found to be inefficacious (Koman).

The leaf and the flowers are not an antidote to either snake (Mhaskar and Caius) or scorpion (Caius and Mhaskar) venom.

Assam: Nahor—; *Behar:* Nagkeshur—; *Bengal:* Nagesar, Nagkesar—; *Bombay:* Nagchampa, Thorlachampa—; *Burma:* Gangau, Kengau—; *Canarese:* Kanchana, Nagakesara, Nagasampige—; *Ceylon:* Naka—; *Coorg:* Atta, Irupumara—; *English:* Ceylon Iron-wood, Ironwood of Assam—; *French:* Arbre de fer, Bois d'anis, Bois de fer—; *Hindi:* Naghas, Nagkesar—; *Indo China:* Thiet luc moc, Vap—; *Kadir:* Peri, Suruli—; *Konkani:* Nagchampa—; *Magahi:* Kainggo—; *Malay:* Matopus, Penaga kunyet, Penaga lilin, Penaga putih, Penaga sabut, Penaga suga—; *Malayalam:* Nagachempakam, Nanga, Peri, Vainavu, Veluttachempakam, Veluttapala—; *Marathi:* Nagachampa, Nagchampa, Nagchampha, Nagchapha—; *Michi:* Nahshor—; *Nepal:* Nagesuri—; *Persian:* Narmishka—; *Pulaiya:* Atuponnai—; *Punjab:* Nagkesar—; *Sanskrit:* Bhujangakhya, Champeya, Hema, Hemakinjalka, Ibhakhya, Kanchana, Kanchanavhaya, Kanakavhaya, Kesara, Keshara, Kinjalka, Mahaushadha, Naga, Nagakeshara Nagakhya, Nagakinjalka, Nagapushpanaga, Nagaya, Phalaka, Phanikeshara, Pinjara, Punnagakeshara, Pushparachana, Bajapushpa, Rukma, Shatapadapriya, Suvarna, Suvarnakhya, Svaraghatana—; *Sind:* Nakesuru—; *Sinhalese:* Deyana, Na, Nagaha—; *Tagalog:* Malabocboc, Malabucbuc—; *Tamil:* Irul, Karunangu, Malainangu, Mannainangu, Naganchambagam, Nagappu, Nagesuram, Nangu, Nirnangu, Patai, Pudangoli, Sirunagappu, Tadinangu—; *Telugu:* Gajapushpamu, Kesaramu, Kinjalkamu, Nagachampakamu, Nagakesaramu, Sikatimanu, Suvarnamu—; *Tinnevelly:* Nang—; *Tulu:* Kesara, Nagasampai—; *Urdu:* Narmishka—; *Uriya:* Nageshvar, Nageshvoro, Nagokesoro—.

TERNSTROEMIACEAE.

Trees or shrubs. Leaves alternate, simple, mostly evergreen; stipules 0. Flowers mostly solitary, rarely paniculate or racemose, often showy, actinomorphic, hermaphrodite, rarely male and female; bracts often paired below the calyx. Sepals 5, free or shortly connate,

much imbricate; petals 5, hypogynous, free or slightly connate, imbricate or contorted; stamens numerous in several series, rarely definite, hypogynous, free or shortly connate, sometimes adnate to the base of the petals; anthers 2-celled, opening lengthwise, very rarely by terminal pores. Ovary superior, sessile, 3-5-celled; styles free or connate; ovules 2 or more in each cell, rarely 1, axile. Fruit dehiscent or not, loculicidal or septicidal, often leaving a central column. Seeds with usually scanty endosperm and straight or curved embryo variously folded or spirally twisted.—Tropical Asia and America, a few in Africa.

Peduncles 1-flowered. Petals imbricate. Anthers versatile. Fruit dehiscent or loculicidal. Radicle short, straight or curved.

1. Seeds winged. Radicle inferior .... SCHIMA.
2. Seeds winged. Radicle superior .... GORDONIA.
3. Seeds wingless .... CAMELLIA.

Stimulant, astringent, and antidysenteric properties. Some barks are powerful vesicants.

The stimulants owe their action to the alkaloids caffeine and theophylline. Methyl salicylate and quercitrin have been isolated from some of them.

OFFICIAL:—Caffeine (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States).

Theophylline (Germany, Japan, United States).

Camellia japonica Linn. (Japan); *C. sinensis* (Linn.) O. Kuntze (Great Britain).

Thea chinensis Linn. (Austria),— Sims. (France); *T. viridis* Linn., and *T. Bohea* Linn.=*T. chinensis* Sims. (Portugal).

SCHIMA Reinw. ex Blume.

Trees with papery evergreen leaves. Peduncles usually erect, axillary or solitary or the uppermost shortly racemed. Flowers handsome, 2-bracteolate. Sepals 5, subequal. Petals 5, much larger, connate at the base, the outermost concave and subcucullate. Stamens many, adnate to the base of the petals. Ovary 5- (rarely 4-6-) celled; styles simple or slightly lobed at the apex with broad spreading

stigmas; ovules 2-6 in each cell, attached laterally, subpendulous. Capsule woody, depressed-globose, loculicidal, with a persistent axis. Seeds flat, kidney-shaped, dorsally winged, hilum central, albumen scanty; cotyledons foliaceous, flat or crumpled, accumbent; radicle inferior, curved upwards.—Species 10.—Indo-Malayan.

The bark is vesicant.

S. noronhae Reinw. is used medicinally in Indo China.

1. **Schima wallichii** Chois. in Zoll. Syst. Verz. Ind. Archip. 144.—Plate 109.

A large tree, the young shoots silky pubescent, the branchlets lenticellate. Leaves oblong-lanceolate to lanceolate, obtuse or acute at base, shortly but sharply acuminate, 19-12.5 cm. long, on an 1.2-2.5 cm. long petiole, usually slightly silky pubescent and pale-coloured beneath, the nerves and net-veination distinct. Flowers about 2.5-3.8 cm. diam., white and fragrant, on 1.2-2.5 cm. long lenticellate pedicels, arising singly from the axils of the leaves. Sepals rounded, nearly twice broader than long, densely silky inside. Capsules globose, woody, the size of a bullet, while young silky.

Distribution: Nepal, Sikkim up to 5,000 ft., Bhutan, Assam, Khasia Hills, Manipur, Chittagong, Upper Burma.

The bark is nearly black externally, with deep clefts; the liber is made up of an abundance of white, needle-shaped cells, which are readily detached and act as cowage, in producing painful irritation, when brought into contact with the skin.

Anthelmintic and rubefacient.

Assam: Chilauni, Makria, Makusal, Mukriasal—; *Bhutia:* Samching—; *Burma:* Ananpho, Laukya, Theetya—; *Cachar:* Jam—; *Duars:* Chilauni—; *Garo:* Boldak—; *Goalpara:* Gugera—; *Hindi:* Chilauni, Makriya, Makriyachilauni, Makusal—; *Khasia:* Dingan—; *Lepcha:* Sambrong—; *Nepal:* Aulechilaune, Chilauni, Goechassi—; *Sikkim:* Chilauni—.

Camellia Linn.

Trees or shrubs. Leaves evergreen, serrate, coriaceous or membranous. Flowers axillary, solitary, or aggregated, sessile or

shortly stalked, often handsome. Sepals 5-6, unequal, graduating from the bracts towards the petals. Petals slightly coherent at the base. Stamens numerous, the outermost in many rows, slightly or almost wholly monadelphous, adherent to the base of the petals; the innermost, 5-12, free. Ovary 3-5-celled; styles free to the base, or more or less united; ovules 4-5 in each cell, pendulous. Capsule woddy, usually short, loculicidal. Seeds mostly solitary in each cell, wingless, albumen 0; embryo straight, cotyledons thick, radicle short, superior.—Species about 10.—From India to Japan.

Root and bark astringent and antidysenteric; leaves astringent, antidysenteric, digestive, tonic, and diaphoretic.

C. japonica Linn. is used medicinally in China, *C. thea* Link. in China and Indo China.

OFFICIAL:—The oil from the seeds of *C. japonica* Linn. in Japan.

In Great Britain *C. sinensis* (Linn.) O. Kuntze as a source of caffeine.

1. **Camellia thea** Link. Enum. Hort. Berol. II, 73.—*C. theifera* Griff. Notul. IV, 558, t. 601, f. I, 3.—*C. theifera* Hook. f. Fl. Brit. Ind. I, 292.—*Thea sinensis* Linn. Sp. Pl. 515.

A shrub or small tree, glabrous or slightly pubescent. Flower solitary, peduncles with a few distinct bracts, sometimes a second flower in the axil of one of them. Sepals round, very obtuse. Petals white, obovate, obtuse, glabrous or pubescent on the back. Stamens glabrous, ovary villous, styles 3 glabrous, connate beyond the middle. Capsule depressed, 3-cornered, 3-seeded. Testa hard, shining.

Distribution: Assam and hilly country to the E. of it, Upper Burma.—Cultivated for ages in China and Japan. Now extensively cultivated in Assam, Cachar, Sikkim, N.-W. Himalaya, Nilgiris and Ceylon.

The leaf is hot with a sharply acrid taste; a good appetiser and stomachic; destroys "kapha" and "pitta", stimulates "vata" (Ayurveda).

Bitter and sharply acrid; diaphoretic, diuretic, detergent and resolvent; useful in thirst, hemicrania, pain in the heart, eye troubles,

piles, inflammations; purifies the blood and brightens the brain (Yunani).

Tea is astringent and gently excitant and exerts a decided influence over the nervous system.

The following have been isolated from the leaves:—(1) methyl alcohol; (2) methyl salicylate; (3) acids—boheic, gallic, tannic—; (4) alkaloids—caffeine, theobromine, theophylline—.

The proportion of caffeine found in tea varies considerably.

Arabic: Chha—; *Assam:* Hilkat—; *Burma:* Letpet—; *Cachar:* Dullicham—; *Canarese:* Cha, Chaha, Theyale—; *Chinese:* Ming—; *Danish:* The—; *Dutch:* Thee—; *English:* Assam Tea, China Tea, Indian Tea, Tea—; *French:* Thé, Thé de Chine, Théier—; *German:* Thee—; *Hindi:* Chha—; *Hungarian:* Tea—; *Indo China:* Cao lo, Cha, Cha ginh, Che, Te ve, Tra, Tra hue—; *Italian:* Te—; *Japanese:* Teh, Tsja—; *Lepcha:* Chau—; *Malaya:* Cha, Te—; *Malayalam:* Chaya, Teyila—; *Marathi:* Chaha—; *Mundari:* Cadaru—; *Muttack:* Khlap, Misaphlap, Phlap—; *Nepal:* Chha—; *Persian:* Ca, Chha, Chaika thai—; *Polish:* Te—; *Portuguese:* Cha, Cha da India—; *Roumanian:* Ceaiu—; *Russian:* Tshay—; *Sanskrit:* Chaha, Chavika—; *Scotch:* Te—; *Sinhalese:* Thaygas—; *Spanish:* Te, Te de China—; *Swedish:* Thee—; *Tamil:* Karupputteyilai, Pachaitteyilai, Teyilai—; *Telugu:* Nallateyaku, Teyaku, Tiyaku—; *Tulu:* Cha—; *Turkish:* Chai—; *Urdu:* Chai—; *Uriya:* Cha—.

GORDONIA Ellis.

Trees. Leaves evergreen, entire or crenate. Flowers solitary and axillary, or crowded at the ends of the branches, often subsessile, bracteate. Sepals usually 5, unequal, graduating from the bracts to the petals. Petals free or slightly connate, much imbricate, the inner the larger. Stamens indefinite, usually 5-adelphous, or connate into a ring, or adnate to the base of the petals. Ovary 3-5- (rarely 6-) celled; ovules 4-8 in each cell, pendulous; style simple; stigma 5-lobed. Capsule woody, oblong, loculicidal; axis persistent. Seeds flat or compressed, prolonged upwards into an oblong, wing; albumen 0; embryo generally straight, oblique; cotyledons ovate,

flat or slightly crumpled; radicle small, superior.—Species 20.—Indo-Malaya, China, N. America.

The genus is therapeutically inert.

1. **Gordonia obtusa** Wall. Cat. (1828) 1459; Wight Ill. I, t. 39.

A tall tree. Leaves 5-10 by 2.5-3.8 cm., elliptic-lanceolate, obtuse, often emarginate, crenulate, acute at the base, glabrous, shining; petioles 6 mm. long. Flowers 3.8 cm. across, white; pedicels 6 mm. long. Sepals orbicular-oblong, silky outside. Petals obcordate, pubescent outside, slightly connate at the base; styles combined to the apex; stigma peltate, 4-5-lobed. Capsules 2.5-3.2 cm. long, oblong; valves deeply sulcate towards the apex. Seeds terminated by a leafy wing.

Distribution: Konkan, W. Ghats of the Madras Presidency chiefly of the Eastern side, usually from 5,000—7,000 ft., lower in Travancore.

In the Nilghiris an infusion of the leaves is given as a stomachic, stimulant, and appetiser.

Badaga: Nagatte—; *Kadir:* Atangi, Ola—; *Nilghiris:* Nagetta—; *Tamil:* Miyilai—.

DIPTEROCARPACEAE.

Trees with resinous wood. Leaves alternate, simple; indumentum of stellate hairs or of peltate scales; stipules small or large, deciduous. Flowers hermaphrodite, actinomorphic, fragrant, in axillary panicles; bracts usually absent; calyx-tube short or long, free or adnate to the ovary; lobes 5, imbricate or valvate, usually enlarged and wing-like in fruit. Petals 5, much twisted, free or slightly connate, often hairy. Stamens usually numerous, hypogynous or subperigynous, anthers 2-celled, opening lengthwise, with produced connective. Ovary 3-celled; style entire or 3-lobed; ovules 2 in each cell, pendulous or lateral, anatropous. Fruit indehiscent, mostly 1-seeded. Seeds without endosperm. Cotyledons often

twisted, enclosing the radicle.—Genera 25. Species 350.—Palaeotropical, chiefly Indian.

A. Calyx much enlarged in fruit, segments erect.
  1. Calyx in fruit with a distinct tube. Fruit free .... DIPTEROCARPUS.
  2. Calyx in fruit with an obscure tube, aestivation of the calyx imbricate.
    a. 3 or all the calyx-segments enlarged, the stamens 15-∞ subulate-cuspidate .... SHOREA.
    b. 2 calyx-segments enlarged; stamens 10-15, subulate-cuspidate .... HOPEA.
B. Calyx scarcely enlarged in fruit, segments reflexed. Stamens 15-∞ .... VATERIA.

Many members produce valuable gums—Gurjun balsam, wood oil, gum anime —, and some yield a very good quality of camphor. The seeds are generally oleaginous.

Poisonous borneol has been obtained from DRYOBALANOPS.

OFFICIAL:—*Shorea spp.* (Russia, Spain); *S. stenoptera* Buck. (Holland); *S. Wiesneri* Stapf (Russia, Spain).

Hopea spp. (Austria).

DIPTEROCARPUS Gaertn. f.

Lofty resinous trees. Leaves coriaceous, entire or sinuate-dentate; stipules large, valvate, enclosing the terminal bud, afterwards caducous, leaving an annular scar. Flowers large, few in axillary racemes, white or reddish. Calyx smooth, or variously ribbed or winged, or transversely lamellate; tube free; lobes slightly imbricate when young, afterwards open or subvalvate, unequal. Stamens indefinite; anthers linear; connective acuminate. Ovary 3-celled; ovules 2 in each cell; style filiform. Fruit nut-like, 1-(rarely 2-) seeded, woody, indehiscent, free, enclosed in the enlarged calyx 2 lobes of which are produced into long wings. Seed adnate to the base of the pericarp; cotyledons very large and fleshy, unequal; radicle inconspicuous.—Species 70.—Indo-Malayan.

A. Calyx-tube in fruit without ribs or wings.
  1. Young branches glabrous or canescent .... 1. *D. turbinatus.*
  2. Young branches more or less hairy .... 4. *D. pilosus.*
B. Calyx-tube in fruit 5-angled or winged.
  1. Angles confined to the upper portion of the calyx-tube .. 2. *D. tuberculatus.*
  2. Angles or wings prolonged to the base of the calyx-tube or nearly so.
      Angles winged .... 3. *D. alatus.*

Many species produce a valuable olea-resin, known as wood oil, which is used in medicine.

The following are used in Dutch India—*D. gracilis* Blum., *D. littoralis* Blum., *D. retusus* Blum., *D. spanoghei* Blum., *D. trinervis* Blum.—; in the Philippine Islands—*D. affinis* Brandis, *D. grandiflorus* Blanco, *D. pilosus* Roxb., *D. polyspermus* Blanco, *D. trinervis* Blum., *D. vernicifluus* Blanco—; in Indo China—*D. alatus* Roxb., *D. artocarpifolius* Pierre, *D. intricatus* Dyer, *D. tuberculatus* Roxb., *D. turbinatus* Gaertn.—.

1. **Dipterocarpus turbinatus** Gaertn. f. Fruct. III (1805) 51, t. 188; Parker in Ind. For. Rec. Bot. ser. XIII (1927) 9, pl. II; This. Dyer in Hook. f. Fl. Brit. Ind. I, 295 (partim).—*D. laevis* Ham. in Mem. Wern. Soc. VI (1832) 299.—*D. Jourdainii* Pierre Fl. For. Cochinch. (1889) t. 220.—PLATE 110A.

A large tree reaching 36-45 m. in height by 4.5 m. girth. Twigs glabrous except for a ring of pubescence just beneath the scars of the stipules, or covered with a dense felt of minute grey-stellate hairs, not infrequently the twigs are glabrous for one or two internodes only. Leaves variable, on flowering shoots 12.5-25 by 6.3-15 cm., elliptic, elliptic- or oblong-ovate, rarely oblong, acute or acuminate, base cuneate, rounded or very slightly cordate, margin more or less repand, glabrous on both surfaces, coriaceous, shining, main lateral nerves 12-16 pairs; petioles 2.5-3.8 cm. long, glabrous, stipules 9-12.5 cm. long, densely grey-stellate and slightly pilose. Flowers in axillary, 3-7-flowered spikes, sometimes one axillary and one terminal spike arising from the same point, rhachis with peduncle 5-10 cm. long, glabrous and glaucous, zigzag, the lowest flower often shortly pedicellate; bracteoles linear, as long as the calyx-tube, very caducous. Calyx-tube campanulate or obconic, 1-12.5 cm. long, smooth, glabrous and glaucous, lobes 3, short, less than 2.5 mm. long, rounded, 2 linear-oblong about 1.2 cm. long. Petals 3.8-6.3 cm. long, linear, pubescent especially outside. Stamens 28-30, filaments flattened, about 3.8 mm. long, anthers about 6 mm. long, connective produced in a bristle 4-5 mm. long. Ovary minutely tomentose, style stellate-pubescent in the lower half, glabrous above, nearly

1 cm. long. Fruit-belly 2-3 cm. diam. by 3-3.8 cm. long, smooth, ovoid, glaucous, produced at the base in a short stalk; wings 11.5-18 cm. long, 2.5-3.8 cm. wide, glabrous, more or less glaucous, usually somewhat pustulate, strongly reticulate, 3-nerved in the lowest third.

Distribution: Assam. Chittagong, Burma, Andamans; not in Bombay Presidency.—Siam, Cochin-China.

The oleo-resin is applied externally to ulcers, ring-worm, and other cutaneous affections. It is stimulant of mucous surfaces, particularly that of the genito-urinary system, and also diuretic. In gonorrhœa and other affections in which copaiba is generally employed, it has proved an effectual remedy.

The chemical composition of wood oil has been determined by L. Weil (Inaug. Dis. Bern, 1903) and E. Lefeuvre (Ann. Inst. col. Marseille, 1905).

Assam: Kuralsal, Kuroil, Tiliagurjan—; *Bengal* Gurjan, Tihyagurjan—; *Burma:* Inbo, Inkanyin, Kanyinbyu, Kanyingyi, Kanyinni, Kanyinnin, Kanyinwettaung, Kanyinwettaw, Kanyinywetgyi, Kanyinywetthe, Maihow—; *Canarese:* Challane, Guge, Valivara—; *Chittagong:* Kaligurjan, Teliagurjan, Tiliagurjan—; *English:* Wood Oil Tree—; *Gujarat:* Gurjun—; *Magahi:* Kanyoung—; *Sinhalese:* Hora—; *Tagalog:* Mayapis—.

2. **Dipterocarpus tuberculatus** Roxb. Hort. Beng. (1814) 93, nomen; Fl. Ind. II (1832) 614; Parker in Ind. For. Rec. Bot. ser. XIII (1927) 21, pl. IV.—*D. grandifolius* Teysm. ex Miq. Ann. Mus. Lugd. Bat. I (1864) 214.—*D. cordatus* Wall. ex A. DC. Prodr. XVI, pt. 2 (1868) 612.—PLATE 111.

A large tree reaching 30-36 m. in height and 3.6-4.5 m. girth. Twigs stout, covered with a dense felt of stellate tomentum, the tomentum sometimes mixed with soft grey hairs so that the shoots are shaggy or the young shoots including the buds and stipules quite glabrous. Leaves on flowering shoots 20-30 by 15-20 cm. on sterile shoots much larger, often 50 cm. long, cordate-ovate, not acuminate, usually markedly repand, either glabrous on both surfaces, or stellate-

pubescent especially on the lower surface, thin but firm in texture, main lateral nerves 9-16 pairs; petioles 5-7.5 cm. long, glabrous or tomentose; stipules 10-15 cm. long, glabrous, tomentose or shaggy. Flowers in axillary, simple or 2-3-branched spikes, in simple spikes the flowers are about 5-8, the lowest flower often distinctly pedicelled, rhachis with peduncle 12.5-20 cm. long, slightly zigzag, clothed like the shoots and petioles; bracteoles 1-3.8 cm. long, linear-lanceolate, those of the lower flowers much bigger than those of the upper, caducous. Calyx-tube 1 cm. long, campanulate, contracted at the base into a distinct pedicel-like stalk, 2.5-10 mm. long, glabrous, stellate-pubescent or densely grey hirsute, lobes 3, short tomentose inside, 5 mm. long, obtuse, 2 linear-oblong rather longer than the tube. Petals 3.8 cm. long, pubescent outside. Stamens 30-33, filaments flattened, about 3.8 mm. long, anthers about 5 mm. long, connective produced in a bristle 2.5-3.8 mm. long. Ovary densely pubescent, style 9 mm. long, densely adpressed hairy below, glabrous for about 2.5 mm. at the top. Fruit-belly 2.3-3.5 cm, long, ovoid or almost globular, glabrous or slightly stellate and pilose, furnished at the apex with 5 tubercles which extend for a varying distance down the fruit, occasionally almost to the base; enlarged calyx-lobes 11-20 by 2.5-4.5 cm., 3-nerved for $\frac{3}{4}$ of their length, usually glabrous, pustulate.

Distribution: Burma.—Siam, Cochin-China.

In Cambodia the roots are used in the treatment of hepatic troubles.

According to Mason, the oleo-resin of this tree is used with assafoetida and cocoanut oil as an application for large ulcers.

Mitter & Palit have isolated inene, a new tricyclic sesquiterpene present in the oleo-resin (14th Ind. Sc. Congress; Lahore, 1927).

Burma: Eng, In, Inbo, Kanyingok—; *Cambodia:* Khlong—; *Teleing:* Sooahn—.

3. **Dipterocarpus alatus** Roxb. Hort. Beng. (1814) 42, nomen; Fl. Ind. II (1832) 614; Parker in Ind. For. Rec. Bot. ser. XIII (1927) 27, pl. V.—*D. incanus* Roxb. Hort. Beng. (1814) 42, nomen; Fl. Ind. II (1832) 614.—*D. gonopterus* Turcz. in Mosc. Bull. (1863) 576.—Plate 110B and Plate 112 (under *D. incanus* Roxb.).

4. **Dipterocarpus Pilosus** Roxb. Hort. Beng. (1814) 93, nomen; Fl. Ind. II (1832) 6 5; Parker in Ind. For. Rec. Bot. ser. XIII (1927) 15, pl. III.—*D. Skinneri* King in Journ. As. Soc. Beng. 62, II (1893) 91.—*D. angustiatus* Heim in Bot. Tidsskr. XXV (1903) 43.

A large tree reaching 45 m. in height by 5 m. girth. Young twigs grey-pubescent, soon becoming glabrous or nearly so. Leaves 10-18 by 6.3-9 cm., elliptic, elliptic-oblong or elliptic-lanceolate, acute or shortly abruptly acuminate, base cuneate or rounded, margin slightly or not repand, rather coriaceous, upper surface adpressed hairy when young, remaining tomentose with minute fascicled hairs on the midrib, ciliate when young, lower surface pilose and tomentose with minute fascicled hairs on the midrib and main nerves; lateral nerves 12-14 pairs; petiole 2.5-3.8 cm. long, tomentose and pilose; stipules 7.5-10 cm. long, densely covered with fascicled and pilose hairs. Flowers in axillary simple, rarely branched, 3-6-flowered racemes, rhachis with peduncle 5-7.5 cm. long, minutely grey-stellate, pedicels of the lower flowers 5-7.5 mm. long, upper flowers subsessile; bracteoles either completely wanting or reduced to a minute scale. Calyx-tube 1.2 cm. long, obconic, grey with minute stellate hairs; lobes 3 short rounded, less than 2.5 mm. long, margins more or less reflexed, 2 linear-oblong 12-15 mm. long, densely grey-tomentose. Petals 3.8-4.3 cm. long, linear-oblong, stellate-tomentose outside and ciliate on one margin, nearly glabrous within. Stamens 28, filaments 3 mm. long, flattened, anthers 5 mm. long, connective produced in a bristle 3.8 mm. long. Ovary densely tomentose, style 1.2 cm. long, tomentose in the lower two-fifths, glabrous in the upper three-fifths. Fruit-belly (in Burmese specimens) about 18-20 mm. diam., subglobose, wings 11-12.5 by 2-2.3 cm., strongly 3-nerved almost to the middle or to much beyond the middle, strongly reticulate, sprinkled both on the wings and belly with small stellate hairs.

Distribution: Sylhet, Chittagong, South Tipperah, Burma, Martaban, Mergui, Andamans, Malay Peninsula.—Siam.

The balsam is used in the treatment of gonorrhoea, gleet, and similar affections of the urinary organs.

Assam: Hollong—; *Tagalog:* Hagachac.

SHOREA Roxb.

Resiniferous trees. Leaves entire or repand, with parallel nerves; stipules large, coriaceous and persistent, or small and deciduous, or inconspicuous. Calyx: Tube very short, not enlarged in fruit, adnate to the torus; lobes ovate-lanceolate, imbricate, unequally enlarged in fruit, wing-like (3 usually larger), closely embracing the fruit. Stamens 15-many; anthers ovate or oblong, rarely linear; connective subulate or cuspidate; valves obtuse, rarely cuspidate, equal, or with the exterior valve the larger. Ovary 3-celled; ovules 2 in each cell; style usually subulate; stigma entire or 3-toothed. Capsule coriaceous, indehiscent, usually 1-seeded, enclosed within the base of the calyx-lobes. Seed ovoid; cotyledons fleshy, unequal, usually enclosing the superior radicle.—Species 90.—From Ceylon to the Philippine Islands.

Stamens 20- ∞.
1. Leaves 15-25 by 10-15 cm. Petiole 2-2.5 cm. .... 1. *S. robusta.*
2. Leaves 6.3-20 by 3.2-11.5 cm. Petiole 2.5-5 cm. .... 2. *S. tumbuggaia.*

All the species abound in various kinds of copalline resins.

The following are used medicinally:—in the Philippine Islands —*S. guiso* Blum., *S. malaanonan* Blum., *S. mangachapuy* F. Vill.—; in Cambodia—*S. cambodiana* Pierre, *S. harmandii* Pierre—.

OFFICIAL:—The oil from the seeds of *S. stenoptera* Buck. in Holland.

The resin from *S. Wiesneri* Stapf and other species in Russia and Spain; from various species in Austria.

1. **Shorea robusta** Gaertn. f. Fruct. III (1805) 48.—PLATE 113.

A deciduous tree, seldom quite leafless, bark dark brown, smooth or with a few longitudinal cracks. Leaves 10-30 by 5-18 cm., ovate-oblong, acuminate, tough, thinly coriaceous, glabrous and shining when mature, base cordate or rounded, lateral nerves 12-15 pairs; petiole 1.2-2 cm. long; stipules 7.5 mm. long, pubescent, deciduous. Flowers 1.2 cm. long, yellowish, in terminal and axillary racemose panicles 7.5-23 cm. long, branches grey-tomentose. Calyx-tube short, not enlarged in fruit, adnate to the torus, lobes 2.5 mm. long, grey-

tomentose outside, ovate, accrescent in fruit. Petals narrow-oblong or lanceolate, silky-tomentose outside. Stamens up to 50, shorter than the petals; connectives with subulate bearded appendages, minutely 3-fid at the apex. Ovary 3-celled; style subulate. Fruit 1.2 cm. long, ovoid, acute, indehiscent, pubescent; wings of the fruiting calyx somewhat unequal, oblong or spathulate, 5-7.5 long, obtuse, with 10-15 longitudinal nerves joined by numerous straight or oblique transverse veins.

Distribution: Kangra district of the Punjab, from the Kalesar forest in the Ambala district along the sub-Himalayan tract to the Darrang district of Assam, sometimes in the outer Himalayan valleys up to 5,000 ft.; Garo Hills, Kamrup, Khasia Hills, Jaintia Hills, from the Santal Parganas through Chota Nagpur and Orissa to Ganjam, Jeypore, Central Provinces, Vizagapatam.

The bark and the leaves are oily, hot, bitter, and acrid; anthelmintic, alexeteric; cure ulcers and wounds, itch, leprosy, gonorrhoea; enrich the blood, stop perspiration, improve the complexion; good in cough, diseases of the vagina, earache, headache.— The fruit is sweet and cooling; aphrodisiac, astringent, cholagogue, tonic; causes "vata"; useful in thirst, burning, tubercular ulcers, and blood troubles.— The resin is cooling but difficult to digest; bitter and acrid; astringent to the bowels; purifies the blood; lessens perspiration and fever; good for wounds, ulcers, burns, pains, itching, fractures, useful in dysentery; good for vaginal discharges (Ayurveda).

The resin has a bad taste and smell; tonic to the brain; good in ascites, menorrhagia, enlargement of the spleen, obesity, ulcers, and wounds; useful in toothache; as a collyrium good for eyesores and burning of the eye.—The oil is good for skin diseases, scabies, and all kinds of wounds (Yunani).

The resin is regarded as astringent and detergent. It is used in dysentery, and for plasters and fumigations. It is commonly given for weak digestion, gonorrhoea, and as an aphrodisiac.

Arabic: Kaikahr—; *Bengal:* Sakher, Sakhu, Sakhua, Sakoh, Sal, Sala, Salwa—; *Bhumij:* Sargi—; *Bombay:* Sal—; *Burma:* Enkhyen —; *Canarese:* Asina, Asu, Ashvakarna, Guggula, Kabbu, Sarja, Vamsa—; *Central Provinces:* Rinjal, Sal, Sarai—; *Deccan:* Ral—; *English:* Common Sal, Indian Dammer, Sal Tree—; *Garhwal:* Kandar—; *Garo:* Bolsal—; *Gujerati:* Ral—; *Hindi:* Sakher, Sakhu,

Sakhua, Sakoh, Sal, Sala, Salwa, Shal—; *Kharwa:* Sakwa—; *Khond:* Jargi—; *Kolami:* Sarjum, Sekura—; *Kumaon:* Sal—; *Lepcha:* Taksalkung—; Teturl—; *Malayalam:* Maramaram, Mulappumarutu —; *Marathi:* Guggilu, Rala, Sajara—; *Nepal:* Sakwa—; *North-Western Provinces:* Kandar, Koron, Sakhu, Sal—; *Oudh:* Koroh—; *Persian:* Lalemoabbari, Lalemohari—; *Punjab:* Sal, Seral—; *Sanskrit:* Agnivallabha, Ashvakarna, Ashvakarnika, Chiraparna, Dhanya, Dirghaparna, Dirghashakha, Divyasara, Jaladashara, Jaranadruma, Kala, Kalalajodhbhava, Karshya, Kashayi, Kaushika, Kaushikahva, Kushika, Lalana, Latashankha, Latataru, Rala, Ralakarya, Sala, Salaniryas, Salaveshta, Sarja, Sarjakarya, Sarjarasa, Sarjjaka, Sasyasambara, Sayasamvera, Shankataru, Shankurriksha, Shasyasambara, Shura, Sidhaka, Sureshtaka, Tarkshyaprasava, Vallivriksha, Vansha, Vastakarna, Yakshadhupa—; *Santal:* Sarjom—; *Sinhalese:* Dammala—; *Tamil:* Attam, Kungiliyam, Shalam—; *Telugu:* Gugal, Guggilamu, Saluva, Sarjakamu, Sarjamu—; *Uraon:* Sekwa—; *Urdu:* Ral—; *Uriya:* Sagua, Salo, Salwa, Shalua, Sodingi, Soringhi, Sorjjo—.

2. **Shorea tumbuggaia** Roxb. Fl. Ind. II (1832) 617; Bedd. Fl. Sylv. t. 5.—*Vatica Tumbuggaia* Wight & Arn. Prodr. 84; Wight Ic. t. 27.—PLATE 114.

A large tree. Leaves ovate or oblong-cordate, acuminate, 5.6-7.5 by 3.8-11.5 cm., base truncate or emarginate, glabrous on both surfaces, lateral nerves about 8 pairs; petiole 2.5-5 cm. Flowers in terminal panicles about 20 cm. long, shortly pedicelled; buds densely hoary. Peduncle and rhachis of panicle nearly glabrous. Stamens about 30; anthers with a hairy appendage. Stigma 3-lobulate. Capsule 2 cm. long, ovoid, acuminate, pubescent above; bases of segments of fruiting calyx 1.2 cm. long, ovate, hoary; wings 2-3 times as long as the capsule, spathulate, obtuse, 8-10-nerved.

Distribution: Forests of the Cuddapah, N. Arcot and Chingleput Hills, up to 3,000 ft.

The resin is used as an external stimulant.

English: Green Dammer—; *Malayalam:* Tampakam—; *Tamil:* Karundanbai, Karuppudamar, Tambagam, Tambai, Tambugai—; *Telugu:* Guggilamu, Jalari, Nalladammara, Nallaguggilamu—.

HOPEA Roxb.

Resinous tree, glabrous or hoary-tomentose. Leaves quite entire, coriaceous, usually penninerved and reticulately veined; stipules small, deciduous or inconspicuous. Flowers small, in axillary and terminal panicles, sessile or shortly pedicelled; bracts O. Calyx: tube very short, adnate to the torus; lobes short, obtuse, imbricate, often with membranous margins, in fruit enlarged, the 2 largest wing-like, erect, the others small, all closely embracing the fruit. Stamens 15 (rarely 10); anthers ovate or orbicular, cells obtuse, valves equal; connective subulate or cuspidate. Ovary 3-celled; ovules 2 in each cell; style shortly terete or subulate. Fruit nut-like, indehiscent, usually 1-seeded, closely enclosed within the base of the calyx-lobes. Seeds ovoid; cotyledons fleshy, unequal, enclosing a superior radicle.—Species 50.— Indo-Malaya.

H. odorata Roxb. is used medicinally in Cambodia.

The gum resin of several species is officinal in Austria.

1. **Hopea odorata** Roxb. Hort. Beng. 42.—*H. decandra* Buch. ex Wight. Ill. 88.

Evergreen, good yellowish brown, close-and even- grained, very durable. Glabrous, except inflorescence. Leaves ovate-lanceolate, secondary nerves 12 pairs. Flowers fragrant, in axillary grey-tomentose panicles, petals ciliate at margin, anthers oblong. Ovary gradually narrowed into conical stylopodium and long cylindrical style. Ovary and stylopodium puberulous.

Distribution: From Pegu and Tenasserim to Cochin-China, Andamans.

Among the Burmese the resin, reduced to powder, forms a popular styptic.

In Cambodia the bark is used as an astringent in gingivitis.

Andamans: Rimda—; *Burma:* Thengan—; *Cambodia:* Koki—.

VATERIA Linn.

Resinous trees, glabrous, tomentose or furfuracious. Leaves quite entire, coriaceous, penninerved, reticulately veined; stipules small, deciduous or inconspicuous (rarely large and persistent).

Flowers white, in terminal panicles, or 1-3 on axillary peduncles. Calyx: Tube very short, adnate to the torus; lobes imbricate, scarcely enlarged in fruit, reflexed. Stamens 15 or more; anthers linear or oblong, the exterior valves of the cells the largest with involute margins; connective rarely produced. Ovary 3-celled; ovules 2 in each cell; style subulate; stigma small. Capsule ovoid or globose, coriaceous or fleshy, 1-seeded, indehiscent or 3-valved. Seeds thick; cotyledons thick, unequal, the largest usually lobed, involute, enclosing the superior radicle.—Species 3.—Seychelles, S. India.

The resin of *V. indica* Linn. is used medicinally.

1. **Vateria indica** Linn. Sp. Pl. (1753) 515.—PLATE 115.

A large and very handsome tree; bark whitish; young branches and inflorescence clothed with hoary, stellate pubescence. Leaves 12.5-20 by 5-10 cm. elliptic-oblong, shortly pointed or obtuse, cordate or rounded at the base, glabrous; lateral nerves 12-15 pairs, very prominent beneath; petioles 2.5 cm. long, stout. Flowers 6 mm. diam., remote, in large terminal panicles 15-20 cm. long; bracts ovate, acute, caducous; pedicels 6-12 mm. long. Calyx divided nearly to the base; lobes oblong-lanceolate, hoary-puberulous on both surfaces, not enlarged in fruit, deflexed. Petals a little longer than the calyx, oblong, obtuse, white. Stamens numerous (about 50); anthers slightly hairy at the base, otherwise glabrous, cells linear; connective adnate to the apex of the anther, produced into a subulate point, splitting along with the anther. Ovary pubescent; style longer than the stamens, filiform, glabrous; stigma small. Capsule 6.3 by 3.8 cm., oblong, obtuse, fleshy, 3-valved, the valves 1-seeded.

Distribution: Western India: From N. Kanara to Travancore up to 3,500 or 4,000 ft., chiefly in evergreen forests, but occasionally along rivers in deciduous forests. In Coorg both in the Ghat forests and east of the Ghats up to 3,500 ft., in the latter locality always in evergreen forest.

The bark is hot with a sharp, bitter, acrid taste; alexipharmac; cures cough, anaemia, ear diseases, urinary discharges, skin eruptions, ulcers and wounds; useful in dysentery, leprosy, itch (Ayurveda).

The resin is of three kinds—reddish, dark, slightly white; bitter, becoming more bitter as it gets older; alexipharmac, tonic, bechic, carminative, expectorant, detergent; good for sore throat and in

chronic bronchitis, piles, rheumatism, amenorrhoea, diarrhoea, hemicrania, tuberculous glands, boils, and ringworm; the smoke is good in painful piles and beneficial to the foetus in pregnant women (Yunani).

Under the influence of gentle heat, the resin combines with wax and oil and forms an excellent resinous ointment; it forms a good substitute for officinal resin. Fine shavings are administered internally to check diarrhoea.

The fruit yields a solid fatty oil, which has obtained considerable repute as local application in chronic rheumatism and some other painful affections.

Arabic: Mukilijraka—; *Bengal:* Chundrus—; *Bombay:* Ral—; *Canarese:* Bilidhupa, Biliguggula, Dhupa, Dhupada, Dupa, Guggula, Maddidhupa, Mandadupa, Rala, Shandike—; *Coorg:* Bilidupa—; *Deccan:* Sufeddamar—; *English:* Indian Copal Tree, Piney Varnish Tree, White Dammer Tree—; *Greek:* Sandaraki—; *Hindi:* Kahruba, Sageddamar, Sandras—; *Malayalam:* Kunturukkam, Pantam, Payani, Payin, Perumpayani, Telli, Vellakkunturukkam—; *Persian:* Buejhudan—; *Sanskrit:* Ajakarna, Dhupa, Kundura, Mandadhupa, Marichapatraka, Pitaphada, Sarjaka, Shala—; *Sinhalese:* Hal, Haldumula—; *Tamil:* Attam, Kukkil, Kukkulu, Kundurukkam, Kungiliyam, Kungulu, Sadagulai, Tubam, Vellaikkundurukkam, Vellaikkungiliyam—; *Telugu:* Dupadamaru, Telladamaru, Tellaguggilamu—; *Tulu:* Lobhana, Paini, Tandoligeda—; *Urdu:* Guggul—.

MALVACEAE.

Herbs, shrubs or rarely trees; stellate hairs often present. Leaves alternate, usually palmately nerved, simple lobed or digitate, stipules free, caducous or 0. Flowers regular, usually bisexual, often large and showy and frequently with an involucre of bracts below the calyx. Sepals usually 5, valvate, more or less united. Petals usually

5, more or less adnate to the base of the staminal tube. Stamens many, rarely few, monadelphous or rarely 5-adelphous; anthers ultimately 1-celled. Ovary 2-many-celled, entire or lobed, of 2-many carpels; ovaries 1 or more in each cell; styles distinct or connate. Fruit of dry indehiscent cocci, or capsular and loculicidal, or rarely large woody and indehiscent.—Genera 35. Species 700.—Tropical and temperate regions.

A. Herbs or shrubs. Ripe carpels separating from the axis. Styles as many as the carpels.
  I. Ovule solitary, ascending.
    a. Stigmas linear.
      1. Bracteoles 6-9 .... ALTHAEA.
      2. Bracteoles 3 .... MALVA.
    b. Stigmas capitate .... MALVASTRUM.
  II. Ovule solitary, pendulous.
    Carpels convergent at the points or beaked .... SIDA.
  III. Ovules 2 or more.
    Carpels with no false partition .... ABUTILON.
B. Styles or stigmatic branches twice as many as the carpels.
  I. Carpels opposite the petals.
    a. Carpels unarmed .... MALACHRA.
    b. Carpels beset with spines .... URENA.
  II. Carpels opposite the sepals .... PAVONIA.
C. Herbs or shrubs. Fruit capsular. Sepals leafy. Staminal tube truncate or 5-toothed at the apex.
  I. Stigmas spreading. Seeds reniform. Stamens numerous. Bracteoles 5 or more .... HIBISCUS.
  II. Stigmas coherent in a club-shaped mass.
    a. Bracteoles 3-5, small .... THESPESIA.
    b. Bracteoles 3, large, cordate .... GOSSYPIUM.
D. Trees. Sepals leathery. Styles connate or free. Fruit capsular or indehiscent. Leaves simple or lobed. Bracteoles 4-5 .... KYDIA.

Mucilaginous and emollient; also laxative, antibilious and antiscorbutic. Some members yield volatile oils which are stimulant, diaphoretic, and diuretic. The seeds are often oleaginous.

All the members, to the number of several hundreds, agree in containing mucilage freely, and in possessing no unwholesome properties.

Among the products obtained by analysis may be mentioned:—(1) mucilage; (2) furfurol; (3) glucosidal pigments—althaein, gossypetin, malvin—; (4) glucosides—gossypitrin, isoquercitrin,

quercimeritrin—; (5) nitrogenous substances—β-asparagin, betaine, choline—; (6) alkaloids—ephedrine, pseudoephedrine—.

OFFICIAL:—*Abelmoschus Manihot* Medic. (Japan).

Althaea officinalis Linn. (Austria, Belgium, Denmark, France, Germany, Holland, Hungary, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, United States).

Gossypium spp. (Austria, Germany, Great Britain, Japan, Spain, Sweden, Switzerland, Turkey, United States); *G. barbadense* Linn. (Austria, Russia); *G. hirsutum* Linn. (Russia); *G. herbaceum* Linn. (Austria, Portugal, Russia, Spain, United States).

Lavatera sylvestris Brot. (Portugal).

Malva spp. (Portugal); *M. neglecta* Wallroth (Germany, Switzerland, Turkey); *M. nicaeensis* Allioni (Italy); *M. rotundifolia* Linn. (Portugal); *M. silvestris* Linn. (Austria, Germany, Hungary); *M. sylvestris* Linn. (Belgium, France, Italy, Norway, Portugal, Switzerland, Turkey); *M. vulgaris* Fries (Austria, Norway).

ALTHAEA (Tourn.) Linn.

Herbs pubescent or villous. Leaves lobed or partite. Flowers axillary, solitary or clustered, or arranged in a terminal raceme. Involucral bracts 6-9, connate at the base. Staminal-tube divided to the apex into numerous antheriferous linear filaments. Ovary many- (more than 5-) celled; ovule 1 in each cell; styles as many as the carpels, longitudinally stigmatose on the inside. Carpels forming a round depressed fruit, separating from each other and from the short central axis.—Species about 30.—Temperate regions of the Old World.

1. Stem 15-30 cm. high. Flowers 13-20 mm. diam. .... 3. *A. ludwigii.*
2. Stem 60-90 cm. Flowers 2.5-5 cm. diam. .... 1. *A. officinalis.*
3. Stem often exceeds 1.8 m. in height. Corolla often exceeds 10 cm. across .... 2. *A. rosea.*

This genus is well known for its emolient and resolvent properties.

The following are commonly used medicinally:—in Europe—*A. cannabina* Linn., *A. hirsuta* Linn., *A. officinalis* Linn., *A. pallida* Waldst. u. Kit., *A. rosea* Cav.—in China and Indo China—*A. rosea* Cav.— .

OFFICIAL:—*A. officinalis* Linn. : root (Denmark, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden, Switzerland, United States); root and leaves (Austria, Germany, Holland, Hungary); root and flowers (France, Turkey); root, leaves and flowers (Belgium).

1. **Althaea officinalis** Linn. Sp. Pl. (1753) 586.—PLATE 116A.

A perennial, uniformaly downy herb. Stem erect, 60-90 cm. Leaves ovate or ovoid, simple or slightly lobed, annular, base scarcely cordate, unequally toothed. Stipules linear-subulate. Flowers peduncled, in axillary clusters, 2.5-5 cm. diam., rosy. Bracteoles linear-lanceolate, half the length of the sepals. Anthers subglobose. Ovary many-celled; ovules one in each cell. Carpels numerous, ultimately separating from a short torus. Seed solitary in each carpel, ascending.

Distribution: Kashmir.—Oriental region, Europe.

The root and seeds are suppurative and emollient; analgesic, good in lumbago, earache and inflammation of the breast; prescribed in coughs and irritable condition of the intestines and bladder; used as emollient enema. The leaves and flowers are applied to burns and parts bitten by venomous reptiles (Yunani).

The whole plant, especially the root, yields in decoction a plentiful tasteless colourless mucilage, very salutary in cases of irritation. It is used as a demulcent for children and is a favourite medicine with the French who use it constantly in poultices, lozenges, etc.

Marsh Mallow is also a popular remedy in England where the dried root is used in the form of a decoction or made into an ointment.

An infusion of the flowers of this mallow was given to cases of bronchial catarrh and bronchitis, but no beneficial result was observed in any of the cases (Koman).

The leaves and flowers are useless as an external application in snake-bite (Mhaskar and Caius).

Every part of the plant yields mucilage, β-asparagin, betaine, starch, and sugar.

Arabic: Bazarulkhatme—; *Bombay:* Gulkhairo, Khaira, Khairakajhor, Khitmi, Khitmikajhor—; *Catalan:* Malvi, Malvins—;

Cutch: Gulkhair—; *Danish:* Altaea, Ibisk—; *Deccan:* Gulkhairo, Khaira, Khairakajhor, Khitmikajar—; *Devonshire:* Drunkards, Meshmellish—; *Dutch:* Heemst—; *English:* Bread and Cheese, Bulls-eyes, Guimauve, Marsh Mallow, White Mallow, Wymote—; *French:* Althée, Althée officinale, Guimauve, Mauve blanche—; *Friuli:* Altee—; *Genoa:* Artea, Arteja, Marva iscu, Marvavestic—; *German:* Adewurzel, Attigkraut, Eibisch, Fliesskrautwurzel, Flusskrautblume, Gilfwurz, Gimorwurzel, Guimauvewurzel, Heiligkraut, Heilwurz, Heilwurzblume, Heinisch, Hemisch, Hemstwurzel, Henest, Hibisch, Hilfskraut, Hilfswurzel, Hustewurzel, Ibisch, Ibischpappel, Ibsche, Ivisch, Kinderbettee, Wilde Malvenwurzel, Weisse Pappel, Sammtpappel, Schleimwurzel, Stockwurzkraut, Weisse Suessholzwurzel, Wollkraut—; *Greek:* Altaia, Hibiscos—; *Gujarat:* Gulkhair, Khaira—; *Hindi:* Gulkhairo, Khaira, Khairakajhor, Khitmigajhar—; *Hungarian:* Fejer Malval, Ziliz—; *Italian:* Altea, Avisch, Bismalva, Benefischi, Buonvischio, Davisch, Malvaccioni, Malvavischio, Malvischio, Marvaiscu—; *Languedoc:* Maoula blanca—; *Madagascar:* Fiandrilavenombazaha—; *Malta:* Marsh Mallow, Altea, Malvaccioni—; *Marathi:* Khaira, Gulkhair—; *Norway:* Altaea—; *Persian:* Gulkhairo, Jukhamekhatme, Khaira, Khairakajhor, Khitmi, Khitmikajhar—; *Portuguese:* Malvaisco—; *Reggio:* Bonaves'c—; *Romagna:* Maibon—; *Roumania:* Nalba mare, Zamosita—; *Russian:* Altei, Dikaya roja, Podswonok, Proskurniak, Prosvirniak—; *Sardinia:* Narbaonia, Pramacisca, Rosa d' Ispagna—; *Somerset:* Bull Flower, Pool Flower—; *Spanish:* Altea, Malvavisco—; *Swedish:* Altea—; *Tamil:* Simaitutti—; *Turkish:* Hatmi—; *Tuscany:* Erba que fa pisciar i buoi, Ibisco—; *Urdu:* Khatme, Khitmi—; *Venice:* Malvaviscio—.

2. **Althaea rosea** Cav. Diss. II (1786) 91, t. 29, f. 3.—Plate 116B.

A biennial herb. Stem often reaching 2.4-3 m., erect, stout, simple, more or less hispid with fascicled branched hairs. Leaves large, 7.5-12.5 cm. diam., long-petioled, cordate-ovate, acutely 5-7-lobed. Flowers large, often exceeding 10 cm. across, purple, rose, or white, short-pedicelled, forming long terminal racemes.

Involucre monophyllous, large, cup-shaped, segments 6-9, obtuse, often bifid. Calyx large, 5-cleft, downy, segments acute. Petals very broad, waxy, obcordate or somewhat cuneate. Staminal tube short, anthers pale yellow. Ovary many-celled, each cell 1-ovuled.

Distribution: Planted in Indian gardens.—Apparently a native of Crete and Greece.

The seeds of this plant are demulcent, diuretic and febrifuge. The flowers have cooling and diuretic properties. The roots are supposed to be astringent and demulcent, and are much used in France to form demulcent drinks.

In the Punjab, the flowers are given in rheumatism, and the root in dysentery (Stewart).

The leaves and roots are also used for the same purposes as those of *A. officinalis.*

Applied locally to the bitten part the leaves have no effect in the treatment of snake-bite (Mhaskar and Caius).

The plant yields althaein, a pigment belonging to the anthocyanin group.

Chinese: Shu k'uei—; *Dutch:* Stokross—; *English:* Hock Herb, Hollyhock, Round Dock—; *French:* Alcée, Alcée rose, Althée, Althée rose, Bâton de Saint-Jacques, Bourdon de Saint-Jacques, Guimauve rose-trémiĕre, Mauve arborée, Mauve des jardins, Mauve rose, Passe-rose, Rose Alcée, Rose ă bâton, Rose de mer, Rose d'outre-mer, Rose papale, Rose trémiĕre—; *German:* Augenpappel, Baummalve, Baumrose, Brandrose, Braunrose, Ehrenrose, Felriss, Feuerbluete, Gartenmalve, Glockenpappel, Glockrose, Halsrose, Herbstrose, Herzleuchte, Hochleuchte, Kohlrose, Roemische Malve, Mundrose, Nackrose, Rosenpappel, Schwarzmalve, Siegmarsblume, Stangenrose, Stockmalve, Stockrise, Ungerblume, Weinrose, Wetterrose, Winterrose—; *Greek:* Altaia—; Indo *China:* Thuc quy—; *Italian:* Malvarosa, Malvoni—; *Malta:* Hollyhock, Malvarosa, Malvoni, Rosoni, Bastun ta San Giusepp—; *Roumanian:* Nalba de gradina—; *Russian:* Chernaya roja, Shtok-rosa—; *Spanish:* Malva arborea, Malva loca, Malva real—.

3. **Althaea ludwigii** Linn. Mant. (1767) 98.

A prostrate, hairy annual, branched from the base. Leaves

2.5-3 cm. diam., orbicular, deeply 5-7-lobed; lobes cuneate, 3-5-fid at the apex; petioles 5-10 cm. long, slender. Flowers axillary, 3-1 together; pedicels 6-25 mm. long. Involucral bracts 7-9, linear, as long as the calyx, hispid with long white and stellate hairs. Calyx-lobes 8 mm. long, deltoid. Corolla 1.2-2 cm. diam., whitish. Anthers round. Fruit 8-12 mm. diam., carpels 8-9, doubly keeled, not winged, wrinkled at the sides, glabrous. Seeds smooth, brown.

Distribution: Agra, Bundelkhand, Punjab, Sind, Baluchistan, Deccan.—Oriental region, Mediterranean, S. Africa.

In Wad the plant is used as an aperient, being for the purpose pounded and mixed with sugar and water and strained (Hughes-Buller).

Kohlu: Gardaibutai, Girdaebutae—; *Wad:* Pachko—.

Malva (Tourn.) Linn.

Herbs hirsute or downy. Leaves angled or lobed. Flowers axillary, solitary or clustered, pedicelled. Involucral bracts 3 (very rarely 2), distinct. Staminal tube divided to the apex into numerous antheriferous filaments. Ovary many- (more than 5-) celled; ovule 1, in each cell; styles as many as the carpels, filiform, longitudinally stigmatose on the inside. Carpels forming a round depressed fruit, separating, when ripe, from each other and the short central axis, indehiscent, not beaked.—Species 30.—Temperate Europe and Asia, N. Africa.

1. Corpels 10-12 enclosed within the accrescent calyx, prominently ribbed at the back .... 4. *M. verticillate.*
2. Carpels 13-16 not reticulated on the back, the margins of the back rounded .... 2. *M. rotundifolia.*
3. Carpels about 10-12, 2-keeled on the back .... 1. *M. sylvestris.*
4. Carpels 10, reticulated on the back, the 2 margins of the back keeled .... 3. *M. parviflora.*

All species are remarkable for their mucilaginous and cooling properties.

The following are used medicinally in Europe—*M. alcea* Linn., *M. althaeoides* Cav., *M. hispanica* Linn., *M. moschata* Linn., *M. nicaeensis* All., *M. parviflora* Linn., *M. rotundifolia* Linn.,

M. sylvestris Linn., *M. tournefortiana* Linn.—; in China—*M. verticillata* Linn.—; in Indo China—*M. sylvestris* Linn., *M. verticillata* Linn.—; in North America and the West Indies—*M. rotundifolia* Linn., *M. sylvestris* Linn.—; in Madagascar—*M. crispa* Linn.—; in La Reunion—*M. parviflora* Linn., *M. sylvestris* Linn.—; in Southern Africa—*M. parviflora* Linn., *M. rotundifolia* Linn.—.

OFFICIAL:—The leaves of *M. neglecta* Wallroth (Germany, Switzerland, Turkey); the leaves and flowers of *M. nicaeensis* Allioni (Italy); the root, leaves, and flowers of *M. rotundifolia* Linn. (Portugal); the leaves and flowers of *M. silvestris* Linn. (Austria, Germany, Hungary); *M. sylvestris* Linn. : leaves (Turkey), flowers (Belgium, France), leaves and flowers (Italy, Switzerland), root, leaves, and flowers (Portugal); *M. vulgaris* Fries: the leaves (Austria), the herb (Norway); the roots, leaves, and flowers of many species of genus MALVA (Portugal).

1. **Malva sylvestris** Linn. Sp. Pl. (1753) 689; Blatter Beautiful Fl. Kashmir I (1927) 62, pl. 15, fig. 2.—PLATE 117 (left hand figure).

A perennial, 0.3-1.2 m. high. Stem tall, erect, strong, woody, branched. Leaves on long stalks, 3-7-lobed, reniform at the base, lobes radiating from a common centre, the lobes shallow, the margin scalloped, smooth above, roughly hairy below. Bracteoles ovate, entire, shorter than the campanulate calyx. Corolla 3.8 cm. diam., purple, with veins of deeper tint, much longer than the calyx. Flower-stalks slender, spreading. Fruit smooth, netted, with short style. Seeds many, reniform.

Distribution: W. temperate Himalaya from the Punjab to Kumaon, 2,000—8,000 ft. —In Bombay, Mysore and Madras a weed of cultivation.—Siberia, Caucasus, Europe, N. Africa.

All parts of the plant are mucilaginous and cooling; febrifuge; good for blepharitis and all inflammatory conditions; internally good for sore throat, chronic bronchitis, jaundice, and enlargement of the spleen; useful in strangury, urinary discharges, and scorpion sting (Yunani).

Mucilaginous and emollient. In tenesmus it is employed as a clyster; in external inflammations as a poultice.

This mallow is said to possess mucilaginous, demulcent and cooling properties. It is used in affections of the mucous membrane of the pulmonary tract and of the urinary bladder. It was given a fair trial in bronchial catarrh and bronchitis, but the result was disappointing (Koman.)

The plant is useless in the treatment of scorpion sting (Caius and Mhaskar).

The plant contains malvin, a glucoside of the anthocyanin group.

Afghanistan: Gulikhadmi—; *Arabic:* Khitmi, Khubaji—; *Bombay:* Khubasi—; *Canarese:* Sannabindigegida—; *Catalan:* Malva major—; *Danish:* Katost—; *Deccan:* Vilayatikangoie—; *Dutch:* Kaasjeskruid, Maluwe, Malve—; *English:* Bread-and-Cheese, Cheese-cake, Cheese Log, Cheese-flower, Chock-cheese, Chucky-cheese, Common Mallow, Custard Cheeses, Dock, Frog-cheese, High Mallow, Loaves-of-Bread, Mallow, Marsh Mallow, Maul, Maws, Pancake Plant, Pick Cheese—; *French:* Beuret, Beurrat, Fouassier, Fromagelet, Fromageon; Fromageot, Herbe ă fromage, Herbe ă lâcher, Herbe Saint-Simon, Maule, Mauve, Grande mauve, Mauve officinale, Mauve sauvage, Mauve verte, Mauve de ville, Meule—; *German:* Baerwinde, Blaugloeckel, Blaumalve, Feldmalve, Feldpappel, Feldriss, Feld-winde, Fuenfaderkraut, Gaenselaetsche, Gaensepappel, Hanfpappel, Hanfwurzel, Kaselskraut, Katzenkaese, Katzentee, Kesselkraut, Kornwinde, Malve, Milzkraut, Papelle, Papellkraut, Pappelkaese, Pferdepappel, Rossmalve, Rosspappel, Schwelkraut, Schwollkraut, Siegmarskraut, Toeppel, Waldmalve, Wewinne, Blaue Winde, Ziegerli, Zwischenkraut—; *Greek:* Malachi—; *Hindi:* Gulkhair, Kunzi, Vilayatikangai—; *Hungarian:* Malyva, Papsajt—; *Indo China:* Cam quy—; *Italian:* Malva, Malvone—; *La Reunion:* Mauve—; *Malta:* Common Mallow, Malva, Hobbeiza—; *North-Western Provinces:* Kanji, Tilchuni—; *Patna:* Khatmi—; *Persian:* Khitmiikuchak, Khu-bazi, Nanakillagah, Nanikulagh, Towdrie—; *Polish:* Shaz ziele—; *Portuguese:* Malva, Malva ordinaria—; *Roumanian:* Nalba—; *Russian:* Lyesnaia malva, Prosvirka—; *Sind:* Khabaji—; *Spanish:* Malva, Malva Comun—; *Sussex:* Maller—; *Swedish:* Katost—; *Turkish:* Ebegumeci—; *Urdu:* Khubaji—.

2. **Malva rotundifolia** Linn. Sp. Pl. (1753) 688.—PLATE 117 (right hand figure).

A much-branched herb, sparingly pubescent and with some stellate hairs. Leaves 1.2-3.8 cm. diam., suborbicular, cordate, crenate; petioles up to 5-10 cm. long. Pedicels axillary, 1-5 together, 1.2-3.8 cm. long, deflexed in fruit. Involucral bracts half the length of the calyx, lanceolate, hairy. Calyx hairy; lobes 5 mm. long, ovate, acute. Corolla 2 cm. diam., pale purple or white; petals notched at the top, bearded at the claw. Fruit 6-8 mm. diam., olive-brown; carpels 13-16, pubescent, not reticulated on the back, the margins of the back rounded, not keeled. Seeds brown-black, glabrous.

Distribution: Sind, Baluchistan, Waziristan, plains of N. India, ascending to 10,000 ft., from Kumaon.—Oriental regions, Europe, N. Africa.

The leaves are mucilaginous and emollient, employed externally in scurvy, and reckoned useful in piles (Honigberger).

The seeds possess demulcent properties; they are prescribed in bronchitis, cough, inflammation of the bladder, and haemorrhoids; the seeds are also externally applied in skin diseases.

At Hindubagh in Baluchistan the plant is used as a cooling drug (Hughes-Buller).

In the Transvaal, Europeans apply a poultice of the leaf in inflammations of the breast.

The leaf has been used in Europe and America, in the form of an infusion or a decoction, for catarrh, dysenteries, and nephritis. As decoction, fomentation, or poultice, it is given in sore throat and ophthalmia, or for maturing abscesses.

Afrikaans: Kiesieblaar—; *Canarese:* Kadukadalegida—; Malva petita de fulla rodona—; *Danish:* Lille Katost—; *Dutch:* Rundbladige maluwe—; *English:* Cheese Cake Flower, Dwarf Mallow, Round-leaved Mallow—; *French:* Fromageon, Fromaget, Herbe de Simon, Petite mauve, Mauve a feuilles rondes, Mauve ronde, Menthe de cimetiere—; *German:* Kaesepappel—; *Harboi Hills:* Fochako—; *Hindi:* Khubasi, Sonchala—; *Hindubagh:* Sarkukar—; *Italian:* Malva comune, Malva minore—; *Kalat:* Uthpar—; *Kharan:* Pachko—; *Languedoc:* Malbré—; *Portuguese:* Malva—; *Pushtu:*

Kukerai—; *Roumanian:* Casui popei, Nalba marunta, Nalba mica—; *Sind:* Chandiri, Khabazi—; *South Africa:* Dwarf Mallow, Mallow—; *Spanish:* Malva de hoja redonda—; *Telugu:* Trikalamalli—.

3. **Malva parviflora** Linn. Amoen. Acad. ed. 2, III (1787) 416.—PLATE 118.

A spreading herb, 15-45 cm. high, pubescent and with some stellate hairs. Leaves 2.5-6.3 cm. diam., suborbicular, cordate, obscurely 5-7-lobed, finely crenate; petioles long, up to 5-10 cm. Pedicels axillary, 1 or few together, short, rarely exceeding 2 cm. Involucral bracts short, linear, caducous, hairy at tip. Calyx in fruit accrescent, reticulately veined, glabrous; lobes ovate, mucronate. Corolla 1.2-2 cm. diam., purplish or white. Fruit 6 mm. diam.; carpels 10, glabrous, strongly reticulated on the back, the two margins of the back keeled, sometimes slightly winged, often with a few minute teeth. Seeds black glabrous.

Distribution: Bengal, U. Provinces, Kashmir, Punjab, Sind, Baluchistan, Bombay, Deccan, Mysore, Madura.—Afghanistan, Persia, Arabia, Mediterranean, Nubia.

The seeds are used as a demulcent in coughs, and ulcers in the bladder.

In La Reunion the plant is used as an emollient and pectoral.

In South Africa Europeans drink an infusion of the leaf as a nerve tonic, and apply the leaf as a hot poultice to wounds and swellings. The Xosas have a similar use to the latter, and often use a decoction as a lotion.

The Sutos use the decoction of the leaf as a remedy for tape-worm and for profuse menstruation. They also make a lotion for bruised limbs from the plant.

Afrikaans: Kasieblaar, Kiesieblaar—; *Makran:* Guragpad—; *Punjab:* Gogisag, Nanna, Narr, Panirak, Sonchal, Supra—; *South Africa:* Mallow—; *Suto:* Mosalasuping, Qena, Thibapitsa, Tikamotse—; *Xosa:* uNomolwana—.

4. **Malva verticillata** Linn. Sp. Pl. 689.—*M. rotundifolia* Wight Ic. t. 950.

Stellately hairy. Stems erect, 0.3-1.2 m. Leaves 5-15 cm.

across, lobes shallow. Flowers small, crowded in nearly sessile clusters. Bracteoles narrowly lanceolate, acute. Petals pale pink, nearly twice as long as the calyx.

Distribution: Temperate Himalaya up to 12,000 ft.—N. Asia, N. Africa, Europe.

In Indo China the root is used to produce vomiting in whooping-cough. The leaves and young stems are considered digestive and they are given to women in the advanced stage of pregnancy. The ash of the dried leaves is employed in the preparation of a drink which is given in scabies.

Assam: Laffa—; *Chinese:* K'uei—; *Indo China:* Dong quy—.

MALVASTRUM A. Gray.

Herbs or shrubs. Leaves entire or lobed. Flowers axillary or in a leafy terminal spike; bracteoles 3, narrow. Calyx cup-shaped, 5-parted. Petals longer than the sepals. Staminal tube bearing anthers on the outside up to the top. Ovary 5- or more- celled; styles as many as the cells; stigmas capitate. Cocci free at maturity, indehiscent, 1-seeded. Seeds ascending.—Species about 60.—American and S. African, except 2 which are cosmopolitan in the tropics.

M. coromandelianum Garcke is used medicinally in the West Indies, *M. spicatum* A. Gray in French Guiana.

1. **Malvastrum coromandelianum** Garcke in Bonpland. V (1857) 297.—*M. tricuspidatum* A. Gray Pl. Wright (1852) 16.—*Malva tricuspidata* Ait. Hort. Kew. ed. II, IV, 210.—*M. coromandeliana* Linn. Sp. Pl. 687.

An erect branching herb or undershrub, 0.6-0.9 m. high. Stem, petiole and main nerves on the lower surface of the leaf stellately hairy, with the hairs few-branched, ascending or descending; hairs on the blade often simple. Leaves up to 6.5 cm. long, ovate or ovate-lanceolate, irregularly toothed, 5-nerved at the base, nerves impressed above, prominent beneath; petiole up to 18 mm. long, not swollen near the base, flattened or slightly channelled above, densely hairy; stipules 5 mm. long, linear, hairy. Peduncles 0-12 mm. long. Bracteoles 3, linear, about half the length of the calyx. Calyx

campanulate, cleft about half way down; lobes 5, triangular, acute. Corolla 12 mm. across, pale yellow, exceeding the calyx. Staminal tube antheriferous to the top without sterile teeth. Styles as many as carpels; stigmas capitate. Carpels 8-12, reniform with 3 projecting spines, bristly between the spines.

Distribution: A native of America, introduced into India and now found in the Madras and Bombay Presidencies, the Punjab and the United Provinces, Orissa, Bengal.

In the West Indies the plant is considered emollient, resolvent, and bechic. The leaves are applied to inflamed sores and wounds as a cooling and healing salve. The flowers are given as a pectoral and diaphoretic.

French Guiana: Ouadé-ouadé.

SIDA Linn.

Herbs or undershrubs, hairy and with stellate hairs. Leaves toothed; stipules linear, 6-8 mm. long. Pedicels axillary, solitary or clustered, disarticulating in fruit at a constriction below the calyx. Involucral bracts 0. Sepals 5, valvate, connate below for $1/3$—$1/2$ their length. Corolla small, yellow or white; petals connate at base and with the staminal tube. Staminal tube divided at the top into numerous antheriferous filaments. Ovary of 5-12 cells; ovule 1, in each cell, pendulous; styles as many as the carpels; stigmas terminal. Fruit globose, depressed, enclosed by the calyx; carpels separating from each other and from the central axis, beaked or not. Seeds black-chestnut, smooth.—Species about 120.—Cosmopolitan.

A. Prostrate trailing herb .... 1. *S. veronicaefolia.*
B. Erect or suberect, herbs or undershrubs.
  Stellately hairy.
    1. Petiole spiny at the base .... 2. *S. spinosa.*
    2. Petiole not spiny at the base.
      a. Awns hardly $\frac{1}{3}$ the length of the carpels.
        *Leaves lanceolate glabrous on both sides. Flowers yellow .... 3. *S. acuta.*
        **Leaves obovate-cuneate, glabrous on the upper side .... 4. *S. rhombifolia.*
      b. Awns nearly as long as the carpels .... 5. *S. cordifolia.*

The roots of the different species are regarded as cooling, astringent, and tonic.

The following are used medicinally in the Canary Islands—*S. rhombifolia* Linn.—; in the Gold Coast—*S. acuta* Burm. f.—; in Guinea—*S. cordifolia* Linn.—; in La Reunion—*S. acuta* Burm.f., *S. cordifolia* Linn., *S. rhombifolia* Linn.—; in Madagascar—*S. rhombifolia* Linn.—; in Southern Africa—*S. cordifolia* Linn., *S. longipes* E. Mey.—; in Indo China—*S. acuta* Burm.f.—; in the Philippine Islands—*S. acuta* Burm.f., *S. rhombifolia* Linn.—; in Australia *S. rhombifolia* Linn.—; in Central and South America—*S. paniculata* Linn., *S. viscosa* Linn.—; in Brazil—*S. acuta* Burm.f., *S. multiflora* Cav., *S. rhombifolia* Linn.—.

1. **Sida veronicaefolia** Lam. Encycl. I (1783) 5.—*S. humilis* Cav. Diss. V, 277.—Plate 119B (under *S. humilis*).

A perennial much-branched herb; branches prostrate or trailing, sometimes rooting, more or less hairy. Leaves 1.2-5 cm. long, cordate, ovate, acute or acuminate, serrate, sparsely clothed with stellate hairs; petioles 1-2.2 cm. long. Pedicels 1.2-3.8 cm. long, slender, axillary, solitary or twin, jointed a little above the middle. Calyx 4 mm. long, 5-angled, hairy; lobes triangular, acute or acuminate. Corolla pale yellow, slightly exceeding the calyx. Carpels 5, smooth, not reticulated, muticous or with a small slightly 2-lipped beak, not cuspidate. Seeds brown, glabrous.

Distribution: Throughout the hotter parts of India.—Tropical and subtropical regions of the world.

The flowers and unripe fruit are given together with sugar for burning sensation in micturition.

Among the Santals the leaves are pounded and used as a local application to cuts and bruises. They are also given in the diarrhoea of pregnancy (Campbell).

Bengal: Junka—; *Gujarat:* Bhoyabala—; *Hindi:* Bananiyar, Bhiunli, Kharenti—; *Marathi:* Bhoybal, Bhuichikna—; *Mundari:* Jangki, Mindilatanari—; *Sanskrit:* Bhumibala—; *Santal:* Bariar, Bir, Jokhasakam, Tandi—; *Sinhalese:* Bevila—; *Tamil:* Palampasi—; *Telugu:* Gayapuwaku—.

2. **Sida spinosa** Linn. Sp. Pl. (1753) 683.—*S. alba* Linn. Sp. Pl. ed. II, 960.—*S. alnifolia* Linn. Sp. Pl. (1753) 684.—Plate 120.

A suberect branched shrub, grey from minute stellate hairs. Leaves up to 5 cm. long, elliptic, crenate, obtuse or cuneate at the base, rounded or narrowed at the top to obtuse triangular, not acuminate, ultimately glabrate above, grey beneath; petioles 1.2-2.5 cm. long, with often 1-3 small recurved spines beneath the petiole. Pedicels 0-2 cm. long, clustered or solitary, jointed just below the calyx. Calyx grey, stellately hairy; lobes triangular. Corolla slightly exceeding the calyx, pale yellow. Carpels 5, pubescent; awns 2, about half the length of the carpel from a conic base, slightly divergent, with spreading or erect hairs. Seeds smooth, black-brown.

Distribution: Throughout the hotter parts of India from N.-W. India to Ceylon.—Tropical and subtropical regions of both hemispheres.

The root, leaf, and fruit destroy " Kapha " and " Vata "; tonic in wasting diseases; cure ulcers and biliousness; useful in urinary discharges, scalding urine, leprosy, and skin infections; the fruit is also astringent and cooling (Ayurveda).

The leaves are demulcent and refrigerant, and are useful in cases of gonorrhoea, gleet and scalding urine.

The decoction of the root-bark and root is used as a demulcent in irritability of the bladder and in gonorrhoea.

The root acts as a gentle tonic and diaphoretic, and is employed in mild cases of debility and fever.

Arabic: Kulbahebarri—; *Bengal:* Bonmethi, Gorakchaulia, Pilabarela—; *Canarese:* Kadumenthya—; *Deccan:* Janglimethi—; *Gujerati:* Kantalobal—; *Hindi:* Bariara, Gangeran, Gulsakari, Janglimethi, Khareti—; *La Reunion:* Herbe dure—; *Malayalam:* Kattaventiyam, Mayirmanikkam—; *Marathi:* Gandedhaman, Gangeti, Kanteritukati—; *Persian:* Shanbalidebarri, Shamlithedashti—; *Porebunder:* Balnansavenan, Kantalobal—; *Sanskrit:* Avishta, Bhadrandani, Chatupala, Devadanda, Gangeruki, Ghanta, Gorakshatandula, Hrisvagavedhuka, Jhasha, Kharagandha, Kharagandhini, Kharavallika, Kharyashthika Mahagandha, Mahapatra, Mahaphala, Mahashakha, Mahodaya, Nagabala, Pila, Pitberela, Vishvadeva, Vishvadevi—; *Sinhalese:* Kotikambabila, Manmanikam—; *Tamil:* Arivalmanaippundu, Mayirmanikkam—; *Telugu:* Chinnamuttamu,

Chinnamuttavapulagamu, Mayilumanikyam, Muttavapulagamu, Ternallabenda, Tirinelabenda—.

3. **Sida acuta** Burm. Fl. Ind. (1768) 147.—*S. carpinifolia* Linn. f. Suppl. (1781) 307.—PLATE 121 (under *S. carpinifolia* Linn.).

Shrubby, much branched; branches slender, terete, minutely stellately hairy. Leaves 2.5-6.3 cm. long, lanceolate, with rounded base sharply serrate, glabrous on both sides; petioles 0-6 mm. long shorter than the stipules. Pedicels 1-2 in each axil, shorter or longer than the petiole, jointed about the middle. Calyx 6-8 mm. long; lobes triangular, acute. Corolla nearly twice as long as the calyx, yellow. Fruit 5-6 mm. diam.; carpels 5-9, puberlous, not pubescent, strongly reticulated, toothed on the dorsal margins; awns 2, nearly linear, about $1/3$ the length of the carpel. Seeds smooth, black.

Distribution: Hotter parts of India.—Tropics generally.

Root sour and sweet; removes "tridosha"; digestive and diuretic; useful in fever, burning of the body, and urinary discharges (Ayurveda).

The root is regarded as cooling, astringent, tonic and useful in nervous and urinary diseases, and also in disorders of the blood and bile. It is intensely bitter, and is prescribed in infusion, and in conjunction with ginger, in cases of intermittent fever. It is considered by the Hindoo practitioners as a valuable stomachic and useful remedy in chronic bowel complaints; the dose, a small tea-cupful, twice daily.

The authors of the Bengal Dispensatory, after a trial of the roots, were unable to satisfy themselves as to its febrifuge action, but it was found to promote perspiration, to increase the appetite, and to act as a useful bitter tonic. In Goa, the Portuguese value it as a diuretic, especially in rheumatic affections. They also use it as a demulcent in gonorrhœa, and Muhammadans believe this to have aphrodisiac properties.

In the Konkan, the root is applied with sparrow's dung to mature boils.

The leaves, made warm and moistened with a little gingili oil,

are employed to hasten suppuration (Ainslie). In Bengal, the expressed juice of the leaves is used in the form of an electuary, in the treatment of intestinal worms (O'Shaughnessy).

The plant in combination with other drugs is recommended for the treatment of snake-bite (Charaka, Sushruta, Vagbhata, Vaidyavinoda) and scorpion-sting (Charaka, Sushruta).

In the Gold Coast the plant is used to cure venereal disease. The leaves when bruised are slimy and are put on the hands of midwives when they are about to remove dead children from the womb; they are mashed in water and the liquid used as an enema for paralysed children to help them to walk; they are frequently used to cause abortion.

The plant is not an antidote to either snake venom (Mhaskar and Caius) or scorpion venom (Caius and Mhaskar).

Andamans: Sirivadibabila—; *Ashanti:* Sowa—; *Bengal:* Bonmethi, Pilabarelashikar, Shvetberelakoreta—; *Bombay:* Bala, Janglimethi—; *Brazil:* Malva, Vassoura—; *Burma:* Katsaynai, Pyendangnalen—; *Canarese:* Bhimankaddi, Vishakaddi—; *Deccan:* Isarbadi, Isbadi—; *Ewe:* Afidemii—; *Ga:* Shuorblor—; *Goa:* Cha da India—; *Gujerati:* Bala Janglimethi—; *Hindi:* Bariara, Kareta, Kharenti, Paharibariara—; *Indo China:* Bai choi, Vai choi—; *Krepi:* Didinglorme—; *La Reunion:* Grosse herbe dure, Herbe ă balais—; *Madras:* Palambasi—; *Malay:* Kelulut putih, Ketumbar hutan, Poko lidah ular, Sada turi, Telor balangkas—; *Malayalam:* Malatanni, Shiruparuva—; *Marathi:* Chikana, Pata, Tukati, Tupkaria—; *Pampangan:* Higotbalato, Pamalis—; *Porebunder:* Bala, Dungraubal—; *Sanskrit:* Bala, Brihannagabala, Pata, Pila, Pitberela, Rajbala—; *Sinhalese:* Gasbevila—; *Tagalog:* Escobaghaba, Higotbalato, Pamalis—; *Tamil:* Arivalmanaippundu, Arivalmukkan, Kayappundu, Malaidangi, Malaikkurundali, Mayirmanikkam, Ponmusuttai, Vattatiruppi—; *Telugu:* Chittimu, Gayapaku, Muttavapulagamu, Nelabenda, Sahadevi, Visaboddi—; *Tupin:* Tupitcha—; *Twi:* Aponor, Obranetuata, Petekuku, Siwabiri, Sowa—; *Uriya:* Siobola, Sunakhodika—; *Visayan:* Higotbalato, Pamalis, Silhigon—.

4. **Sida rhombifolia** Linn. Sp. Pl. (1753) 684; Parkar Fl. Punjab 35.—Plate 122.

A small erect undershrub. Branches rough with stellate hairs. Leaves very variable in shape, up to 5 cm. by 18 mm., glabrous or subglabrous above, grey-pubescent or hoary beneath, coarsely dentate towards the tip, entire towards the base, 3-5-nerved. Petiole up to 6 mm. long, pubescent, swollen in the upper third. Pedicels axillary or crowded towards the ends of the branches. Calyx 5-angular, hairy; lobes triangular, acuminate. Corolla yellow or white, 8-12 mm. across. Carpels 7-10 with 2 short awns. Seeds smooth, black.

The leaves, the relative length of the pedicels, the position of the joint and the length of the carpellary awns are most variable and the many varieties which have been made are better considered as so many forms to which many others might be added.

(*a*) Forma *retusa;* var. *retusa* Mast. in Hook. f. Fl. Brit. Ind. I, 324.—*Sida retusa* Linn.—Leaves obovate, retuse, or truncate, dark green and glabrous above, more or less tomentose beneath, pedicels equalling, longer or shorter than the petiole, jointed above the middle. Carpellary awns short.

(*b*) Forma *rhomboidea;* var. *rhomboidea* Mast. in Hook. f. Fl. Brit. Ind. I, 34.—*S. rhomboidea* Roxb. Hort. Beng. 50.—Leaves rhomboid-lanceolate, serrate, hoary beneath. Pedicels more than half the length of the leaves, jointed at the base.

Distribution: A weed of waste places, throughout the tropics of both hemispheres.

The root and leaves are sweetish; aphrodisiac, tonic; remove "tridosha"; good in urinary complaints, discharges and strangury; useful in fever, heart diseases, burning sensations, piles, all kinds of inflammation (Ayurveda).

The plant in combination with other drugs is prescribed as an antidote to snake venom (Charaka) and scorpion venom (Charaka, Sushruta).

The root is held in great repute in the treatment of rheumatism.

The Mundas apply the pounded leaves on swellings.

In Lakhimpur (Assam) the roots are taken internally to help childbirth. The herb is also tied round the abdomen for the same purpose (Carter).

The stems abound in mucilage, and are employed as demulcents and emollients both for external and internal use.

In Europe the plant has been regarded as a valuable remedy in pulmonary tuberculosis and rheumatism. Conflicting reports of its efficacy as a tuberculosis remedy have been published.

In Madagascar the plant is mostly used as an emollient; an infusion of the root is given in dysentery; the leaves are pounded and applied to tumours, or chewed and applied to boils.

The plant is useless in the antidotal treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

Afrikaans: Pretoria-bossie, Taaiman—; *Australia:* Jelly Leaf, Queensland Hemp—; *Bengal:* Pitabala, Pithala, Svetbarela—; *Betsileo:* Kisindahorina—; *Canarese:* Bennegaragu, Gubethadegida, Kallangadale—; *Ceylon:* Chittamadi—; *French:* Fausse guimauve, Guimauve des Indes, Herbe ă balais—; *Hindi:* Bariara, Bhiunli, Kharenti Pitabala, Sahadebi, Sahadeva, Swetbarela—; *Hova:* Tsindahoro—; *Indo China:* Choi duc, Ke dong tien, Ke hoa vang—; *Gujerati:* Baladana—; *Katsina:* Miyatsanya—; *La Reunion:* Faux the, Herbe dure—; *Madras:* Sittamutti—; *Malayalam:* Anakkuruntotti, Totti, Valankuruntotti, Vatturam—; *Marathi:* Chikna, Sadeda, Sahadevi—; *Mundari:* Ipiripiung, Pipirpiung—; *Pampangan:* Escobanghaba—; *Porebunder:* Betraubal, Betraubaldana—; *Sanskrit:* Ahikhanda, Atibala, Bala, Barela, Brihadagala, Devaarha, Devabala, Devasaha, Gandhavallari, Gandhavalli, Jyeshthabala, Karambhara, Kesarika, Keshawardhini, Keshruha, Lalbarila, Mahabala, Mahagalarthaprasadini, Mahagandha, Mriga, Mrigadini, Mrigarasa, Pitapushpa, Pitapushpi, Prasadini, Sahadeva, Sahadevi, Samanga, Sarini, Varshapushpa, Varshpushpi, Vataghni, Vatya, Vatyayani—; *Sinhalese:* Kotikanbevila—; *Sokoto:* Miyatsanya—; *South Africa:* Queensland Hemp—; *Tagalog:* Escobanghaba—; *Tamil:* Anaikurundotti, Kurundotti, Tenacham—; *Telugu:* Atibala, Gubatada, Mayilumanikyamu, Muttavapulagamu—; *Tigrinia:* Dechedalro—;

Tulu: Kadiru—; *Uriya:* Dholabadianla, Nalobadianla—; *Visayan:* Besengbaseng, Escobanghaba—; *Zulu:* iVavane—.

5. **Sida cordifolia** Linn. Sp. Pl. (1753) 684.—Plate 119A.

Shrubby, branched, softly hairy and with much stellate hair nearly all over and subpersistent. Leaves 2.5-5 cm. long, cordate, ovate-oblong, crenate, obtuse or subacute, not acuminate; petioles 1.2-3.8 cm. long. Pedicels solitary or few together, short, some up to 1.2-2 cm. long, jointed much above the middle. Calyx 6-8 mm. long; lobes ovate, acute. Corolla slightly exceeding the calyx, yellow. Fruit 6-8 mm. diam.; carpels 7-10, strongly reticulated, ciliate on the upper margins, the two dorsal margins almost scabrid; awns 2, nearly as long as the carpels, linear, retrorsely scabrid-hairy.

Distribution: Tropical and subtropical regions of both hemispheres.

The plant is slightly bitter and sweet; tonic, astringent, emollient, aphrodisiac; removes " vata " and " pitta "; good in cough as a pectoral and bechic. The bark cures urinary troubles and discharges. The fruit is acrid and sweet; digestive, cooling, astringent, aphrodisiac; removes " pitta " and " kapha "; increases " vata; " useful in blood diseases, bleeding piles, diseases of the throat, phthisis, and insanity (Ayurveda).

A decoction of the root with ginger is given by Hindu physicians, in intermittent fever. It is also administered in fever accompanied by shivering fits and strong heat of body. The powder of the root-bark is given with milk and sugar for the relief of frequent micturition and leucorrhoea. In diseases of the nervous system the root is used along, or in combination with other medicines.

The bark of the root with sesamum oil and milk is very efficacious in curing cases of facial paralysis and sciatica when caused by the inflammation of the nerves concerned (Koman; Ind. Med. Gazette, Aug., 1921).

The seeds are reckoned aphrodisiac, and are administered in gonorrhœa. They are also given for colic and tenesmus (Stewart).

In the Konkan, the leaves, with other cooling leaves are applied in opthalmia; the root-juice is used to promote the healing of wounds,

and the juice of the whole plant pounded with little water is given in 1/4 seer doses for spermatorrhœa.

The leaves mixed with rice are given to alleviate the bloody flux.

The Thongas of Portuguese East Africa use the plant as a children's remedy.

In Cambodia the roots are considered diuretic and depurative; they are given in the treatment of gonorrhœa and ringworm.

Bengal: Bala, Barila, Brela, Svetberela—; *Cambodia:* Kantrang bai sa—; *Canarese:* Chittuharalu, Hettutti—; *Ceylon:* Chevakan-pudu—; *Fanti:* Kumpa—; *Gujerati:* Baladana, Khareti—; *Hausa:* Maikafo—; *Hindi:* Barial, Bariar, Khareti, Kharenti, Kungyi—; *Katagum:* Kardafi—; *Konkan:* Kobirsirbhaji, Muttava—; *La Reunion:* Mauve—; *Malay:* Kelulut putih—; *Malayalam:* Katturam—; *Marathi:* Chikana, Khiranti—; *Mundari:* Huring-mindilata—; *Porebunder:* Bal, Bala, Baldana, Balnochotvo—; *Punjab:* Kharent—; *Ranikhet:* Balu—; *Sanskrit:* Badiyalaka, Bala, Baladhya, Balini, Bhadra, Bhadrabala, Bhadrodani, Brela, Jayanti, Kalyanini, Kanaka, Kathorayashtika, Kharakakashtika, Kharayashtika, Krura, Motapati, Nilaya, Odanavha, Odani, Odanika, Phanijivaka, Prahasa, Raktatandula, Samanga, Samansha, Shitapaki, Suvarna, Svetberela, Variga, Vataghni, Vatyalaka, Vatyali, Vatyapushpi, Vilala—; *Sind:* Burrayra—; *Sinhalese:* Hinadona, Walbevila—; *Sokoto:* Garamani, Faringaramani—; *Tamil:* Arivalmanaippundu, Nilatutti—; *Telugu:* Antisa, Chiru-benda, Muttavapulagamu, Suvarnamu, Tellagorra, Tellantisa—; *Thonga:* Sitjhesinyana sa ntlhaba—; *Uriya:* Badiananla, Bisvo-kopari—.

ABUTILON Tourn.

Tomentose herbs or shrubs. Leaves cordate, ovate, toothed or slightly lobed, long-petioled. Peduncles axillary, 1-flowered, jointed near the flower. Flowers yellow. Involucral bracts 0. Staminal tube divided at the top into numerous, antheriferous filaments, Carpels 5-25; styles as many as the carpels, long; stigmas capitate.

Ripe carpels separating from the short central axis, rounded on the back, dehiscent, truncate, pointed, apiculate or with a short oblique or horizontal mucro, 3-5-seeded. Seeds reniform, dark brown.—Species 120.—Tropical and subtropical regions.

Carpels more than 10, usually 15-20.
A. Carpels pointed or with a distinct mucro.
  Carpels 8-13 mm. long.
  a. Carpels hairy, ultimately glabrate, shining .... 1. *A. indicum.*
  b. Carpels densely hairy, ultimately shaggy .... 5. *A. asiaticum.*
B. Carpels obtuse without a mucro.
  I. Corolla 5 cm. diam.
    a. Fruit globose, densely silky villous .... 4. *A. glaucum.*
    b. Fruit roughly hairy .... 2. *A. hirtum.*
  II. Petals hardly exceeding the sepals .... 3. *A. theophrasti.*

The leaves of all the species contain a large quantity of mucilage. The roots are regarded as cooling, astringent, and tonic. The seeds are considered antidysenteric.

The following species are used medicinally in China—*A. avicennae* Gaertn.—; in Indo China—*A. avicennae* Gaertn.—; *A. indicum* G. Don.—; in Malaya and the Philippine Islands—*A. indicum* G. Don.—; in the Gold Coast—*A. asiaticum* G. Don.—; in La Reunion—*A. exstipulare* G. Don., *A. hirtum* G. Don., *A. indicum* G. Don., *A. muticum.* Sw.—.

1. **Abutilon indicum** Sw. Hort. Brit. I (1827) 54.—*Sida indica* Linn. Cent. Pl. II (1756) 26; Roxb. Fl. Ind. III, 179.—Plate 123.

Suffrutescent, minutely hoary-tomentose. Leaves up to 9 by 5 cm. cordate, ovate, acuminate, toothed, rarely subtrilobate; petioles 3.8-7.5 cm. long; stipules 9 mm. long, linear, acute, deflexed. Pedicels often 2.5-5 long, axillary solitary, jointed very near the top. Calyx 12-8 mm. long, divided to the middle; lobes ovate, apiculate. Corolla 2.5 cm. diam., yellow, opening in the evening. Staminal tube hairy at the base; filaments long. Carpels usually 15-20, longer than the calyx, with a distinct small acute point, hairy, ultimately shining, dark brown. Seeds brown-black, densely and minutely scrobiculate.

Distribution: Throughout the tropics.

The bark has a sharply bitter taste; febrifuge, anthelmintic, alexeteric; removes "vata" and "tridosha"; allays thirst, vomiting; lessens perspiration. The root cures uterine haemorrhagic discharges. The milk of the plant cures urinary discharges (Ayurveda).

The bark is good in strangury and urinary complaints. The leaves are prescribed for toothache, lumbago, piles, and all kinds of inflammation. The mucilaginous seeds are tonic; they are good for chest troubles, bronchitis, piles, gonorrhœa (Yunani).

The infusion of the root is prescribed in fevers as a cooling medicine, and is considered useful in strangury, haematuria, as also in leprosy.

The bark is valued as a diuretic.

The leaves are cooked and eaten in bleeding piles. A decoction is used in bronchitis, in catarrhal bilious diarrhœa, in gonorrhœa and inflammation of the bladder, and in fevers; it is prescribed as a mouth-wash in cases of tooth-ache and tender gums.

The seeds are reckoned aphrodisiac and are used as a laxative in piles, and in the treatment of coughs. They are burned on charcoal and the rectum of children affected with thread-worms is exposed to the smoke.

According to the Chinese in Hongkong, the seeds are employed as an emollient and demulcent; the root is used as a diuretic and pulmonary sedative, and the flowers and leaves as a local application to boils and ulcers. Porter Smith states that the seeds and the entire plant are used as "demulcent, lenitive, diuretic, laxative and discutient remedies. Puerperal diseases, urinary disorders, chronic dysentery and fevers are treated with the seeds."

The slightly bitter bark is considered diuretic in the Philippines. The root, leaves, and flowers are used as an emollient.

Arabic: Deishar, Mashtulghola, Mashtulghoul—; *Bengal:* Potari—; *Bombay:* Chakrabenda, Etari, Kangoi, Kangori, Pamadni—; *Burma:* Bonkhoe, Bonkhoye, Thamachok—; *Canarese:* Gidutingi, Hettukisu, Hettutti, Kisangi, Srimudre, Srimudrigida, Tutti—; *Ceylon:* Vaddattutta—; *Chinese:* Kuan Sha Yuan—; *Cutch:* Balbij—; *Deccan:* Chakrabenda Etari, Kangoi, Kangori, Pamadni—; *Goa:* Petari, Tupkadi—; *Gujerati:*

Dabali, Kansaki—; *Hindi:* Jhampi, Kandhi, Kanghani, Kanghi, Potari, Tepari—; *Hongkong:* Tung K'uei—; *Ilocano:* Lulupao—; *Indo China:* Coi xay Dok tok lai—; *Konkani:* Voddlipettari—; *Malay:* Bunga Kisar, Kambong lobo, Malbar—; *Malaya:* Kwan sa yin—; *Malayalam:* Katturam, Katturan, Pitikkapattu, Tutti, Tuvatti, Uram, Velluram—; *Marathi:* Akakai, Kansuli, Karandi, Madmi, Mudra, Mudrika, Pidari, Vikankati—; *Persian:* Darakhteshanah, Darakhteshane—; *Philippines:* Malvas, Malvas de Castilla—; *Porebunder:* Bapat—; *Portuguese:* Fruta gargantilha, Malva—; *Sanskrit:* Atibala, Balika, Balya, Bhuribala, Ghanta, Kankati, Rishiprokta, Shita, Shitapushpa, Vikankata, Vatyapushpika, Vrishyagandha, Vrishyagandhika—; *Santal:* Mirubaha—; *Sind:* Khapato—; *Sinhalese:* Anodagaha—; *Talagog:* Cuacuacohan, Giliggiligan, Guilingguilingan, Melbas—; *Tamil:* Nallatutti, Paniyarattutti, Perundutti, Tutti—; *Telugu:* Adavibenda, Botlabenda, Dudi, Muttavashirubenda, Nugubenda, Peddabenda, Tutirichettu, Tutti, Tutturubenda—; *Tulu:* Urki—; *Twi:* Mmofraforowa—; *Urdu:* Kanghi—; *Uriya:* Nakochono—; *Visayan:* Dulupang, Malis, Pilis, Taratacopes, Yampong—.

2. **Abutilon hirtum** G. Don Gen. Syst. I (1785) 503; Gamble Fl. Madras (1915) 91.—*A. graveolens* W. & A. Prodr. (1834) 56; Mast. in Hook.f. Fl. Brit. Ind. I, 327; Cooke Fl. Bomb. Pres. I, 97.—*A. graveolens* var. *hirtum* Mast. l.c.—*Sida graveolens* Roxb. Hort. Beng. 50.—*Abutilon hirtum* W. & A. Prodr. (1834) 56.—*Sida hirta* Lam. Dict. I, 17.—PLATE 124 (under *A. graveolens* W. & A.).

A shrub, 1-2 m. high. Branches covered with minute glandular pubescence mixed with long white spreading hairs. Leaves 5-7.5 cm. long, orbicular-cordate, sometimes lobed, abruptly acuminate, velvety on both sides; petiole 2.5-5 cm. long. Stipules linear-falcate, reflexed, deciduous. Pedicels as long as the petioles, jointed above the middle. Flowers large orange coloured, with a darker centre, becoming pink when old, ultimately reflexed. Clayx-lobes ovate, acuminate, densely pubescent. Petals obcordate. Carpels 15-20 or more, rounded, hairy, not awned, about as long as the enlarged calyx. Carpels 2-3-seeded. Seeds with minute, shining, stellate hairs.

Distribution: U. Provinces, C. Provinces to S. India and Ceylon, Sind, Baluchistan. —Arabia, tropical Africa, Malaya, Australia.

The roots, leaves, and seeds are medicinal. The uses are the same as those of *A. indicum*.

Bengal: Barkhangi—; *Cawnpore:* Barabanghi, Barkhangi—; *Hindi:* Barkhangi—; *Madras:* Tutti—; *Tamil:* Vadattutti—; *Telugu:* Belabenda—; *Uriya:* Karpuripotro—.

3. **Abutilon theophrasti** Medic. Malv. (1787) 28; Blatter Fl. Arab. (1919) 80.—*Sida Abutilon* Linn. Sp. Pl. (1753) 963; DC. Prodr. I, 470; Roxb. Fl. Ind. III, 178.—*Abutilon Avicennae* Gaertn. Fruct. II (1791) 251, t. 135; Boiss. Fl. Or. I, 856; Rchbch. Ic. V, fig. 4832; Mast. in Hook.f. Fl. Brit. Ind. I, 327.

Annual, herbaceous, covered for the most part with fine down, intermingled with a few villi. Leaves 7-10 cm. long, orbicular-cordate, acuminate, dentate, on both surfaces villous or hispid along the nerves. Petiole 7-8 cm., hispid. Stipules large, oblique, broadly ovate-lanceolate. Inflorescence a terminal, ultimately leafless panicle; pedicels short, solitary, axillary, jointed below the middle. Calyx hispid, deeply 5-parted nearly to the base; segments ovate-lanceolate. Petals yellow, hardly exceeding the sepals. Staminal tube very short. Ripe fruit cylindrical, truncate, umbelicate, longer than the persistent calyx. Carpels 15-20, oblong, truncate, hispidulous or pubescent, dehiscing along the dorsal suture, each 3-seeded with 2 long horizontal spreading ciliolate awns. Seeds covered with tufts of stellate hairs.

Distribution: N.-W. India, Sind, Kashmir, Bengal.—Arabia, Egypt, Mediterranean, S. Eastern Europe. Naturalized in many parts of Asia, Africa and America.

The leaves, seeds, and roots are put to the same uses as those of *A. indicum*.

In Indo China a decoction of the seed is given in dysentery, fistulae, and eye-sores.

Chinese: Ch'ing Ma—; *English:* American Jute, Indian Mallow—; *French:* Jute de Chine—; *Indo China:* Manh ma—.

4. **Abutilon glaucum** Sw. Hort. Br. ed. I (1827) 54.—*A. muticum* Sw. l.c. ed. 2 (1830) 65.

A tomentose undershrub. Leaves up to 7.5-10 cm. diam.,

suborbicular, cordate, very shortly acuminate or obtuse, irregularly toothed, velvety pubescent or tomentose on both sides, base 7-9-nerved; petioles 2.5-7.5 cm. long; stipules 6 mm. long, linear. Peduncles 1.3-5 cm. long, jointed near the top. Calyx 1 cm. long, lobed half-way down, villous; lobes broad, shortly acuminate. Corolla 2.5-5 cm. diam., orange-yellow, petals often lobed. Staminal tube villous at the base. Carpels about 25, densely villous, not beaked. Seeds 3 in each carpel, clothed with minute shining hairs.

Distribution: India, Ceylon.—Afghanistan. Mediterranean region, tropical Africa, Cape, Egypt, Arabia, Australia.

In La Reunion the mucilaginous leaves are used as a pectoral.

5. **Abutilon asiaticum** G. Don. Gen. Syst. I (1831) 503.

Herbaceous or somewhat woody below, densely pubescent. Leaves 5-10 cm. long, ovate cordate, acute or accuminate, serrate, slightly hairy and rugose above, velvety and with prominent veins beneath; petioles 3.2-3.8 cm. Stipules linear, deflexed. Peduncles stout, longer than the petiole, jointed near the flower. Flowers yellow, 5 cm. across. Clayx-lobes oval, acuminate, 3-veined, ultimately deflexd. Ripe carpels about 20, hispid; scarcely longer than the calyx; awns short, erect.

Distribution: E. coast, W. Peninsula, Ceylon.—Tropics of both hemispheres.

In the Gold Coast the leaves are supposed to cure gonorrhoea, and are mashed in water and native peppers are added. Small quantities are drunk at intervals of ten minutes.

Bengal: Petari—; *English:* Country Mallow—; *Ewe:* Kusiti—; *Fanti:* Nwaha—; *Hindi:* Jhampi, Kangahi, Kanghi—; *Krepi:* Didinlomee—; *Marathi:* Chakrabhenda, Kangori, Petari—; *Tamil:* Perundutti, Tutti—; *Telugu:* Botlabenda, Nugubenda, Peddabenda, Tutturubenda—; *Twi:* Apongo, Mmofraforowa—; *Uriya:* Jhonkapedi—.

MALACHRA Linn.

Hispid herbs. Leaves often angled or lobed. Flowers yellow or whitish, in dense heads, with foliaceous involucral bracts. Sepals

5, united into a tube below the middle. Staminal tube short, truncate or 5-toothed at the apex; filaments numerous. Ovary 5-celled; cells 1-ovuled; styles 10; stigmas capitate. Ripe carpels separating from the axis, indehiscent, smooth. Seeds reniform, ascending.—Species 6.—Warmer regions of America, W. Indies. Two species naturalized in Asia and Africa.

M. capitata Linn. is used medicinally in La Reunion.

1. **Malachra capitata** Linn. Syst. ed. 12, II (1767) 458.

A coarsely hispid annual. Leaves 5-7.5 cm. long, cordate crenate, from orbicular more or less lobed or angled, to ovate and entire; petioles 3.8-5 cm. long, jointed below the blade; stipules 1.3-2.2 cm. long, simple, linear or often 2-3-branched, the branches connate at or near the very base, flat at base, above filiform. Pedicels 1.3-5 cm. long, several of different lengths arranged on a very short stout axillary peduncle, each pedicel carrying a 4-leaved involucre, 3 of the leaves of which are equal, the fourth smaller and attached higher up than the others. Involucral leaves with stiff bristles on the margins and on the nerves beneath, variously lobed and toothed, with a white spot at the base and with 2 opposite ciliate appendages, each 10 mm. long, on the short stalk below the blade. Flowers subsessile, 4-6 within the involucre, yellow. Calyx membranous; lobes ovate, acute, prominently margined, the midrib produced into a long bristly point. Carpels 5, rounded on the back, wedge-shaped on the inner side, white when ripe, reticulated with brown veins. Seeds smooth, brown-black.

Distribution: Naturalized throughout the hotter parts of India.—Native of tropical America.

In La Reunion the plant is used as an emollient and pectoral.

Bombay: Banbhendi, Ranbhendi—; *Marathi:* Ranbhendi, Vilayatibhendi—; *Porebunder:* Pardeshibhindo—.

Urena Dill. ex Linn.

Herbaceous tomentose perennials. Leaves usually angled or lobed. Flowers clustered, sessile or shortly pedicelled. Involucral bracts 5, connate at the base, adnate to the tube of the calyx, ultimately rigid. Sepals 5, connate into a cup-shaped calyx. Petals 5, connate

below, united to the staminal tube. Staminal-tube bearing short filaments or subsessile anthers below the truncate or 5-toothed apex. Ovary 5-celled; cells 1-ovuled; branches of the style 10; stigmas capitate. Ripe carpels 5, muticous, covered with glochidiate spines, separating from a short axis, indehiscent.—Species 3.—Warmer regions of both hemispheres.

A. Carpels armed with bristles.
I. Leaves not divided below the middle .... 1. *U. lobata.*
II. Leaves divided below the middle .... 2. *U. sinuata.*
B. Carpels smooth, unarmed .... 3. *U. repanda.*

The root is considered cooling and is used as a resolvent; the leaves are emollient; the flowers mucilaginous and bechic.

The following are used medicinally in the Philippine Islands and Indo China—*U. sinuata* Linn.—; in South America—*U. lobata* Linn., *U. sinuata* Linn.—; in West Africa and La Reunion—*U. lobata* Linn.—.

1. **Urena lobata** Linn. Sp. Pl. (1753) 692; Britton in Addisonia 10 (1925) 19, pl. 330.—PLATE 125.

Herbaceous, erect, 5-10 cm. high. Leaves usually broader than long, up to 11.3 by 15 cm., cordate serrate or toothed, stellately hairy on both surfaces, roundish, angled; lobes generally acute or acuminate varying in size and number (3-10 or more), not extending half way down, sometimes nearly obsolete nerves 5-7, prominent beneath, with often a gland at the base of the midrib and sometimes on the 2 adjacent nerves; petioles variable in length 1.2-15 cm. long, hairy. Pedicels hairy, very short, clustered. Involucral bracts less than 6 mm. long, equalling or slightly exceeding the calyx and alternate with its lobes, linear-oblong, acute, united at the base into a cup, clothed with rigid hairs. Calyx deeply divided; lobes less than 6 mm. long, lanceolate, ciliate. Corolla 15 mm. long, pink. Capsules pubescent, covered with blunt spines, each spine having 2 straight bristles pointing downwards at an angle from the apex. Seeds rounded on the back, wedge-shaped on the inner side, smooth.

Distribution: All tropical countries. A weed of waste places, forest-clearings and roadsides.

In Chota Nagpur the root is employed as an external remedy for rheumatism (Campbell).

The root is a very popular diuretic in Lakhimpur (Carter).

In La Reunion the leaves and roots are made into poultices and used as an emolient; the flowers are considered pectoral.

A decoction of the root and stem is used in Brazil as a remedy in windy colic; the flowers as an expectorant in dry and inveterate coughs.

In Guiana an infusion of the flowers is used as a gargle for aphthae and sore throat.

Akwapim: Petekuku—; *Bengal:* Benochra—; *Betsileo:* Paka, Pampaho, Pampana, Pampano—; *Brazil:* Malvaisco, Malvisco—; *Burma:* Katsaenai, Whetkhyaepanai—; *Canarese:* Otte—; *Dehra-Dun:* Unga—; *Fanti:* Akyeng, Finina—; *Gambia:* Bubobubo, Toja—; *Hausa:* Bakingaramani, Jantsu, Kafirama, Ramaniya Ramarama, Uwarmaganni—; *Hindi:* Bachata, Bachit, Bachita, Brachta—; *Katsina:* Ramaniya—; *Konkan:* Villiah—; *La Reunion:* Hérisson rouge—; *Malayalam:* Udiram, Uram, Uran, Vatto—; *Marathi:* Rantupkada, Rantupkuda, Vanabendha—; *North-Western Provinces:* Bachita—; *Porebunder:* Wagdaubhindi—; *Sakalave:* Kirijy, Kiriza, Kisilenjo, Tsikilenza—; *Sanskrit:* Vanabhenda—; *Santal:* Bhidi-Janetet—; *Sinhalese:* Pattaapele, Valtaepala—; *Sokoto:* Ramaniya—; *Tamil:* Ottatti, Ottuttutti—; *Telugu:* Peddabenda—; *Tupin:* Guaxima—; *Uriya:* Bilokopasia, Jotyaholo—; *Wassaw:* Nsanensa—.

2. **Urena sinuata** Linn. Sp. Pl. (1753) 692.—*U. lobata* Linn. var. *sinuata* King in Journ. As. Soc. Beng. LX, 2 (1891) 43.—PLATE 126.

Shrubby, 5-10 cm. high. Leaves 2.5-7.5 cm. long, more or less stellately hairy on both surfaces, cordate or truncate at the base, irregularly lobed to below the middle; lobes 3-5 or more, dilated upwards, with rounded sinuses, serrate or toothed, pale beneath, with, in most cases, a gland near the base of the midrib and sometimes on one or both of the adjoining nerves; petioles 1-3.8 cm. long. Pedicels short, axillary, clustered. Involucral bracts 6 mm. long, linear-oblong, acute, as long as, or slightly longer than the calyx and

alternate with its lobes. Calyx minutely pubescent; lobes lanceolate. Corolla rose-coloured, 2-2.5 cm. diam., handsome. Capsules and seeds as in U. lobata.

Distribution: Hotter parts of India.—Tropics of both hemispheres.

In Chota Nagpur the root is used as an external application for lumbago.

In the Philippines the root is considered emollient, refrigerant, and maturant; the leaves are prescribed in inflammation of the intestines and the bladder.

The plant is considered emolient in Brazil and a decoction is given in colic; an infusion of the flowers is used in bronchitis.

Bengal: Kunjia—; *Bombay:* Tapkote—; *Brazil:* Carapicho, Carapicu, Urucurana—; *Chota Nagpur:* Berilat—; *Hindi:* Kunjuya, Lotloti—; *Indo China:* Bay, Ke dau ngua, Phu, thien hoa, Vai—; *Malayalam:* Uram—; *Marathi:* Lichi, Ramkopasi—; *Pampangan:* Colotan, Colotcolotan, Dalupan, Molopolo—; *Philippines:* Culutan—; *Porebunder:* Wagdaubhindo—; *Santal:* Motabhedijanetet—; *Sinhalese:* Hinappele—; *Tagalog:* Colotan, Colotcolotan, Dalupan, Dalupang, Molopolo—; *Tamil:* Ottatti, Ottuttutti—; *Telugu:* Nallabenda, Padanikada, Piliyamankena—; *Visayan:* Colotan, Colotcolotan, Culuculutan, Dalupan, Dalupang, Molopolo—.

3. **Urena repanda** Roxb. Fl. Ind. III, 182.—*U. speciosa* Wall. Pl. As. Rar. t. 26.—PLATE 127.

An erect much-branched perennial herb. Leaves shortly stalked, roundish, rarely lobed, rough on the upper surface, midrib glandular at the base beneath; lower 5-6.3 cm. long, cordate, repand-serrate; upper lanceolate. Flowers racemose, ultimately in leafless clusters. Bracteoles 5, 6-8 mm., connate below into a strongly ribbed cup, subcoriaceous, exceeding the membranous calyx. Sepals united for half their length. Corolla pink, twice the length of the bracteoles. Carpels smooth, unarmed. Seed ascending, smooth.

Distribution: Punjab, Dehra Dun, Central Provinces, N. Circars in Ganjam Sal forests, Ava.

The root and bark are believed by the Santhals to be a cure for hydrophobia (Campbell).

Santal: Sikuar—; *Uriya:* Jotojotia, Sikhini—.

PAVONIA Cav.

Herbs or shrubs. Leaves often angled or lobed. Folwers axillary or clustered at the ends of the branches. Involucral bracts 5-∞, nearly or entirely free. Petals 5, connate at the base, adnate to the staminal tube. Staminal tube bearing numerous filaments below the truncate or 5-toothed apex. Ovary 5-celled; cells 1-ovuled; styles 10; stigmas capitate. Carpels 5, separating from the axis or more or less 2-valved, never glochidiate. Seed ascending.—Species 70.—Tropical and subtropical regions.

Diuretic; flowers emolient and bechic.

The following species are used medicinally in Gambia—*P. zeylanica* Cav.—; in La Reunion—*P. columella* Cav., *P. urens* Cav.—; in Madagascar—*P. Bojeri* Baker, *P. macrotis* Baker—; in Brazil—*P. diuretica* St. Hil.—.

Involucral bracts 8-14. subulate.
1. Ripe carpels unarmed wingless .... 1. *P. odorata.*
2. Ripe carpels glabrous, narrowly winged. Leaves usually lobed .... 2. *P. zeylanica.*

1. **Pavonia odorata** Willd. Sp. Pl. III (1800) 837.—PLATE 128.

An erect branching annual, 45-90 cm. high. Stems covered with soft viscous pubescence and a few longer hairs. Leaves 2.5-7.5 cm. long, roundish, ovate, cordate, shallowly 3-5-lobed, dentate or the lower ones entire, stellate-hairy on both surfaces, often felted and whitish beneath; lower petioles longer than the blades. Peduncles as long as the leaves, 1-flowered, clustered at the ends of the branches. Bracteoles 10-12. Sepals lanceolate. Corolla pale pink or white, twice the length of the calyx. Carpels gibbous on their backs, wingless unarmed, dehiscent.

Distribution: N.-W. India, Bundelkhand, Sind, Baluchistan, W. Rajputana, Bengal, Konkan, S. M. Country, N. Circars, Deccan, Carnatic, Ceylon.—E. tropical Africa,

An appetiser and strengthener; refrigerant, stomachic, tonic; removes "kapha" and "pitta"; prescribed in diseases of the heart and blood complaints; cures dysentery, excessive salivation, and ulcers; good for vomiting, thirst, skin eruptions, fever, and asthma (Ayurveda).

The root is fragrant and aromatic, and possesses cooling and stomachic properties; used in fever, inflammation and haemorrhage from internal organs.

It is prescribed as an astringent and tonic in cases of dysentery (Taylor).

In Las Bela the plant is used as a cure for rheumatism (Hughes-Buller).

Bombay: Kalavala—; *Canarese:* Balarakkasigida, Mudivala—; *Gujerati:* Kalowalo—; *Hindi:* Sugandhabala—; *Las Bela:* Zordar—; *Malayalam:* Kuruntotti—; *Marathi:* Kalavala, Sughandabala—; *Sanskrit:* Ambunamaka, Bala, Barhishtha, Hribera, Hrivela, Kachamoda, Keshanama, Keshanamaka, Keshya, Kuntala, Kuntaloshira, Lalanapriya, Toya, Udichya, Vajra, Vala, Valaka, Varapinga, Vari, Varida, Varinamaka—; *Tamil:* Avibattam, Peramutti, Suvesagam—; *Telugu:* Chittibenda, Ettakuti, Muttavapulagamu, Tigebenda—.

2. **Pavonia zeylanica** Cav. Diss. III (1737) 134, t. 48, f. 2.

A perennial undershrub, 0.6-1.2 m. high; branches slender, terete. Leaves roundish, 1.3-2.5 cm. diam., cordate or truncate at base, usually 3-lobed, the midlobe the longest, less commonly entire, denate, stellately hairy; petioles 1.3-3.2 cm. long, viscous-hairy; stipules filiform. Pedicels 2.5-3.2 cm. long, slender, axillary, solitary, viscous-hairy, jointed about three-fourths of their length from the base. Involucral bracts 8-12, free, 1-1.3 cm. long, twice the length of the calyx or more. Calyx-lobes lanceolate. Corolla pink, longer than the involucre. Ripe carpels rounded on the back, wedge-shaped, slightly wrinkled, narrowly winged, glabrous, enclosed in the persistent involucre. Seeds brown-black, minutely pubescent.

Distribution: N.-W. India, W. Rajputana, Sind, W. Peninsula, Circars and Carnatic, Ceylon.—Tropical Africa, Mauritius.

In Gambia the plant is used as a vermifuge and a purgative by the Mandingo natives.

Canarese: Antutogari, Balarakshasi, Chittamutti—; *Mandingo:* Ratch—; *Tamil:* Kurundotti, Mammatti, Sevagan, Sittamutti—; *Telugu:* Chinnamutavapulagamu, Chinnamutennu, Karubenda, Peramutti—.

Hibiscus Linn.

Herbs or shrubs, rarely trees. Flowers axillary or solitary or in a terminal raceme. Leaves various, usually more or less palmately lobed. Involucral bracts 4-12 (rarely O), free, or connate. Sepals 5, valvate, more or less combined into a 5-lobed calyx, sometimes spathaceous and circumsciss. Staminal tube truncate or 5-toothed at the apex; filaments numerous. Ovary 5-celled; ovules 3 or more in each cell; styles 5, more or less connate; stigma capitate or spathulate. Capsule loculicidally 5-valved, sometimes with false dissepiments forming a spuriously 10-celled fruit. Seeds numerous, reniform, subglobose, rarely obovoid, glabrous, tomentose or woolly.—Species 160.—Tropics and subtropics.

A. Style distinctly lobed. Involucre not caducous. Calyx terminated by 5 distinct lobes. Capsule woody, dehiscent, many-seeded .... 9. *H. lampas.*
B. Capsule 5-celled.
  I. Calyx membranous, inflated .... 10. *H. trionum.*
  II. Calyx not inflated.
    a. Involucral bracts distinct, 8-12, forked or provided with a leafy appendage
      1. Stipules semicordate, auricled .... 11. *H. surattensis.*
      2. Stipules lanceolate .... 1. *H. furcatus.*
    b. Involucral bracts without appendages. Seeds cottony. Leaves broad, ovate, not lobed .... 2. *H. micranthus.*
    c. Involucral bracts without appendages, sometimes adnate to the calyx-tube. Seeds smooth, not cottony Calyx-lobes with an obovate gland at the base. Capsule not winged .... 3. *H. cannabinus.*
    d. Involucral bracts adnate to the calyx-tube, accrescent, thick, fleshy, purple .... 4. *H. sabdariffa.*
    e. Involucral bracts 4, distinct .... 12. *H. manihot.*
    f. Involucral bracts more than 5, linear
      1. Involucral bracts shorter than the calyx .... 5. *H. abelmoschus.*
      2. Involucral bracts equalling the calyx .... 6. *H. esculentus.*
C. Capsule with false dissepiments, spuriously 10-celled. Involucral bracts connate at the base. A tree .... 7. *H. tiliaceus.*

D. Cultivated species.
 I. Corolla 7.5 cm. diam., red .... 8. *H. rosa-sinensis.*
 II. Corolla 7.5-10 cm. diam., white or pink .... 13. *H. mutabilis.*

The roots are much used as demulcent. The seeds are considered stimulant and antispasmodic.

The following are used medicinally in Europe—*H. esculentus* Linn., *H. rosa-sinensis* Linn., *H. syriacus* Linn., *H. trionum* Linn.—; in Egypt—*H. abelmoschus* Linn., *H. syriacus* Linn.—; in Guinea—*H. abelmoschus* Linn., *H. esculentus* Linn., *H. sabdariffa* Linn.—; in Gambia—*H. cannabinus* Linn.—; in the Gold Coast—*H. tiliaceus* Linn., *H. vitifolius* Linn.—; in Southern Africa—*H. aethiopicus* Linn., *H. leiospermus* Harv., *H. malacospermus* E. Mey., *H. pusillus* Thunb., *H. trionum* Linn., *H. surattensis* Linn.—; in East Africa—*H. sabdariffa* Linn.—; in La Reunion—*H. esculentus* Linn., *H. liliiflorus* Cav., *H. rosa-sinensis* Linn., *H. sabdariffa* Linn.—; in Madagascar—*H. diversifolius* Jacq., *H. phanerandrus* Baker, *H. tiliaceus* Linn.—; in the Philippine Islands—*H. abelmoschus* Linn., *H. grewiaefolius* Hassk., *H. lampas* Cav., *H. mutabilis* Linn., *H. rosa-sinensis* Linn., *H. surattensis* Linn., *H. tiliaceus* Linn.—; in Malaya—*H. mutabilis* Linn., *H. rosa-sinensis* Linn., *H. syriacus* Linn., *H. tiliaceus* Linn., *H. trionum* Linn.—; in Indo China—*H. abelmoschus* Linn., *H. manihot* Linn., *H. mutabilis* Linn., *H. rosa-sinensis* Linn., *H. syriacus* Linn., *H. tiliaceus* Linn., *H. trionum* Linn.—; in China—*H. manihot* Linn., *H. mutabilis* Linn., *H. rosa-sinensis* Linn., *H. syriacus* Linn.—; in the West Indies and South America—*H. abelmoschus* Linn.—; in Guiana—*H. abelmoschus* Linn., *H. digitiformis* DC., *H. esculentus* Linn., *H. mutabilis* Linn., *H. sabdariffa* Linn., *H. tiliaceus* Linn.—; in Tahiti—*H. rosa-sinensis* Linn.—.

1. **Hibiscus furcatus** Willd. Enum. (1809) 736.—*H. aculeatus* Roxb. Fl. Ind. III, 206.—PLATE 134B.

Suffrutescent, rambling or climbing; stem thinly covered with recurved prickles from thickened coloured bases. Leaves 6.3-7.5 cm. long, clothed with appressed hairs, palmately 3-5-lobed, cordate or truncate at the base, prickly on the nerves beneath, crenate-serrate; lobes acute or acuminate; petioles 5-10 cm. long, prickly. Calyx

enlarged in fruit, deeply divided; lobes lanceolate, hispid with stiff bristles from thickened bases. Involucral bracts 8-12, variable, a prevalent form consisting of a stout stalk, across the top of which is attached a small oblong leafy appendage, which is prolonged upwards into a curved horn, all densely hispid. Flower-buds with a tuft of hairs at the apex; corolla large, 7.5 cm. diam., yellow with purple centre. Capsules 12 mm. long, ovoid, pointed, enclosed in the enlarged calyx.

Distribution: Hotter parts of India and Ceylon.—Tropics of Old World.

An infusion of the roots in water is a good cooling drink for the hot weather (Talbot).

Canarese: Huligowri—; *Malayalam:* Naranampuli, Pachapuli, Suriyamani—; *Sinhalese:* Hinnapiritta, Napiritta—; *Telugu:* Kondagogu, Kondagongura—.

2. **Hibiscus micranthus** Linn.f. Suppl. (1781) 308.—Plate 129 (left hand figure).

Shrubby, erect; branches slender, terete, stellately hairy. Leaves 2.5-5 cm. long, more or less scabrid and hairy, ovate, acute or obtuse, serrate, sometimes cordate; petioles 1.2-2.5 cm. long, often very short towards the top of the plant; stipules 1.2 cm. long, subulate, hairy. Pedicels longer than the petioles, reaching 3.2 cm. long, slender jointed above the middle. Involucral bracts 6, filiform, hairy, longer or shorter than the calyx. Calyx short, deeply divided; lobes lanceolate, hairy. Corolla small, pink or pink and white, stellately hairy outside. Stamens in tufts on the staminal tube. Capsules 6-8 mm. diam., globose. Seeds reniform, cottony.

Distribution: Hotter parts of India from N.-W. India eastwards and southwards to Ceylon.—Arabia, tropical Africa.

The plant is considered a valuable febrifuge in Ceylon.

Asmora: Cheracrantel—; *Ceylon:* Perumaddi—; *Cutch:* Darianujhad, Kurudwel—; *Gujerati:* Chanakbhindo—; *Mensa:* Konatal—; *Porebunder:* Adbaubuporio, Darianujhad—; *Tamil:* Sittamutti—; *Telugu:* Chalabharata, Tuturubenda—; *Tigrinia:* Ligat atolo, Rigaget elo—.

3. **Hibiscus cannabinus** Linn. Syst. Nat. (1759) 1149.—Plate 130.

A shrub with prickly stems. Leaves 5 cm. across, glabrous, cordate (those near the base often undivided), roundish-ovate, the upper deeply palmately 3-5-lobed; lobes usually narrow-lanceolate, serrate; petioles 3.8-5 cm. long, sometimes prickly; stipules 9 mm. long, subulate. Pedicels axillary, very short. Involucral bracts 7-10, free, 9 mm. long, linear, acute often with prickly margins, shorter than the calyx. Calyx (in fruit) 2.5 cm. long, divided three-fourths of the way down; lobes long, lanceolate, very acute, with a strong midrib and thickened, often prickly, margins, and with an oblong-obovate gland at the base of each lobe. Corolla yellow with purple centre. Capsules ovoid, beaked, very hairy. Seeds large, brown, dotted with minute stellate scales.

Distribution: Generally cultivated.—Apparently a native of Africa.

Seed acrid and sour; stomachic, appetiser; removes diseases due to " kapha " and " vata "; cures earache. Leaves used in dysentery; cure diseases of the blood, bile, and throat (Ayurveda).

The seeds are used as an external application to pains and bruises, and are said to be aphrodisiac and fattening.

One tola of the juice of the flowers, with sugar and black pepper is a popular remedy for biliousness with acidity.

The leaves are purgative.

In Gambia an infusion of the leaves is administered in coughs.

Australia: Okra, Surm—; *Bambara:* Daiyan, Dawulu—; *Bauchi:* Jirin da rani—; *Behar:* Kudrum—; *Bengal:* Ambari, Chandana, Mestapat, Nalita, Patsan, Pulu—; *Bombay:* Ambari—; *Bozo:* Fo—; *Canarese:* Holadapundrike, Pundi—; *Chanda:* Ambari—; *Chota Nagpur:* Kudrum—; *Delhi:* Tukhmibhang—; *Djerme:* Bargui—; *Egypt:* Tylbeledy—; *English:* Ambari Hemp, Bastard Jute, Bimlipatam Jute, Bombay Hemp, Deccan Hemp, Hemp Bendy—; *Fulah:* Polli—; *Godavari:* Gaynara—; *Gujerati:* Bhindiyamboi—; *Hausa:* Farar rama, Jar rama, Rama—; *Hindi:* Ambari, Nalita, Patsan, Pulu, San—; *Jhelum:* Shan—; *Kano:* Dirin da rani—; *Katsina:* Karamapnowa, Koka rani—; *La Reunion:* Chanvre de Gombo—; *Malayalam:* Kanjaru—; *Malinke:* Dale—; *Marathi:* Ambada, Ambadi—; *Martinique:* Chanvre de Gombo, Gombo—;

Mundari: Kotoleara, Kotoleipilara—; *North-Western Provinces:* Patsan, Pitwa, Rattiasan—; *Persian:* Sujjado—; *Punjab:* Patsan, Sankokla, Sankokra, Sinjubara—; *Sanskrit:* Amla, Ambalika, Ambashtha, Ambika, Balika, Bhurimalli, Chhinnapatri, Chitrapushpi, Dridhvalka, Gandhapatri, Garnikura, Keshi, Machika, Maryurika, Mayurvidala, Mukhavachika, Nali, Phalamla, Prashthika, Rajjudambastha, Sahasravatamulika, Shathamba, Shreyasi—; *Santal:* Darekudrum—; *Sind:* Sujjado—; *Sokoto:* Kare aiki, Karama mowa—; *Soussou:* Fortobamingui—; *Tamil:* Kachurai, Palungu, Pulichai, Pulicharkirai, Pulimanjai—; *Telugu:* Gogu, Gongura, Gonkura, Gulungu, Pundikura—; *Uriya:* Bhanga, Kanuriya, Kornniya—.

4. **Hibiscus sabdariffa** Linn. Sp. Pl. (1753) 695.—PLATE 129 (right hand figure).

Annual, erect, glabrous, unarmed; stem and branches purple. Leaves 5-7.5 cm. long, cuneate at the base, usually 3-5-lobed (the lower leaves sometimes entire); lobes lanceolate or oblong, the mid-lobe the longest, serrate, glandular on the midrib beneath, often blotched with purple; petioles 4-6.3 cm. long, reddish purple; stipules 12 mm. long, linear, acute. Pedicels axillary, very short, stout, jointed near the base, purple. Involucral bracts 10, lanceolate, shorter than the calyx, adnate to its base, purple. Calyx fleshy; lobes lanceolate, 3-nerved, purple, and, together with the involucre, accrescent in fruit. Corolla purple with darker centre. Capsules ovoid, beaked, hairy. Seeds large, black-brown, closely covered with minute stout stellate hairs.

Distribution: Generally cultivated in the hotter parts of India and Ceylon.—Tropics of the Old World.

The fruit possesses anti-scorbutic properties. The leaves are regarded as emollient.

The succulent calyx is used for the preparation of what is called in Bombay Bazaars "Roselle Jelly" or "Rozal Jelly," and, when dried, as an article of diet like tamarind is used much in curries. In bilious conditions, a diet drink is made by boiling it with water and adding a little salt, pepper, asafoetida and molasses.

In Guinea the leaves are much used as a diuretic, sedative, and refrigerant.

In Hausa the oil from the seeds is used as a medicinal vehicle.

The fruit, leaves, and stems contain d-malic acid.

Antsianaka: Voamahombazaha—; *Bengal:* Lalmista, Mesta, Patwa—; *Bombay:* Lalambari, Patwa—; *Burma:* Chinbaung, Chinpoungni—; *Canarese:* Kempupundrike, Pulachakiri, Pundibija—; *Ceylon:* Pulinchakira—; *Deccan:* Lalambari, Patwa—; *English:* Indian Sorrel, Jamaica Sorrel, Natal Sorrel, Red Sorrel, Rosella, Rozelle—; *French Guiana:* Oseille-de-Guinée rouge—; *Fulah:* Folerebadi, Folereboleyo—; *Ga:* Sakpa—; *Guinea:* Oseille de Guinée—; *Hausa:* Yakuwa—; *Hindi:* Lalambari, Patwa—; *Hova:* Divay—; *La Reunion:* Groseille—; *Malayalam:* Polechi—; *Malinke:* Da—; *Mundari:* Jengaipilara, Jojoara, Telengaipilara—; *Portuguese:* Rosela—; *Santal:* Arakkudrum, Togotarak—; *Sind:* Lalambari—; *Sinhalese:* Ratabilincha—; *Sokoto:* Sure—; *Soussou:* Santonbelli—; *Tamil:* Simaikkasuru, Sivappukkasuru—; *Telugu:* Ettagomgura, Ettagongaka, Ettagonguru, Shimagonguru.—

5. **Hibiscus abelmoschus** Linn. Sp. Pl. (1753) 696; Mast. in Hook.f. Fl. Brit. Ind. I, 342 (excl. *H. sagittifolio* Kurz qui est species distincta).—*Abelmoschus moschatus* Medik. Malv. 46.—*A. rugosus* Wight & Arn. Prodr. 53.—PLATE 131.

A tall annual; stems clothed with long deflexed hairs. Leaves polymorphous, more or less cordate, the lower ovate, acute or roundish-angled, the upper palmately 3-7-lobed divided nearly to the base; lobes narrow-acute, or oblong-ovate, crenate, serrate, or irregularly toothed, hairy on both surfaces; petioles 2.5 cm. long, hariy; stipules 12 mm. long, subulate, hairy. Pedicels stout, equalling or shorter than the petioles. Involucral bracts 8-12, fulvous-hairy, 15 mm. long, shorter than the calyx, caducous. Calyx 3.2 cm. long, hairy, ovoid, cuspidate in bud; sepals connate, except at the tips, 5-toothed at the apex, splitting down one side. Corolla 7.5 cm. across, yellow with purple centre. Capsules fulvous-hairy, oblong-lanceolate, acute. Seeds subreniform, blackish, with a few raised striae.

Distribution: Cultivated in the hotter parts of India.—Tropics of the Old World.

Seeds with bitter and sharp taste; cooling, tonic, carminative, aphrodisiac; cure diseases due to "kapha" and "vata"; intestinal complaints, stomatitis; good in diseases of the heart; allay thirst and check vomiting (Ayurveda).

The seeds have a pleasant taste and flavour; allay thirst; cure stomatitis, dyspepsia, urinary discharges, gonorrhoea, leucoderma, and itch; good tonic and stomachic properties. The roots and leaves are a cure for gonorrhoea (Yunani).

In Bombay the seeds are rubbed to a paste with milk and usd to cure itch.

Mooden Sheriff used a tincture of the seeds and considered it stimulant, stomachic and anti-spasmodic, and recommended its exhibition in cases of nervous debility, hysteria, and as a tonic for dyspepsia.

The seeds are stimulant, tonic, and antispasmodic. In Manila they are given for urinary calculus. In America they are considered a specific antidote for the venom of the rattlesnake and in the West Indies, they are given in the cure of snake-bite, being administered both internally and externally.

In Guinea the seeds are considered stomachic and tonic.

In Brazil the herb is used as a fomentation and an enema.

In Guiana an infusion of the seeds is considered cephalic, stomachic, and antispasmodic.

Whether given internally or applied externally the seeds are equally useless in the treatment of snake-bite (Mhaskar and Caius).

Furfurol has been found in the distillation water from oil of ambrette seeds.

Akim: Orsangmangkrongma—; *Antsianaka:* Sondraranjaza *Arabic:* Habbulmishk, Habbulmushk—; *Bengal:* Mushakdana—; *Betsimisaraka:* Mana—; *Bombay:* Mishkdana, Mushkdana—; *Brazil:* Quicombo, Quigombo do cheiro—; *Burma:* Baluwa—; *Canarese:* Kasturibende—; *Deccan:* Kasturubenda, Mushkbenda—; *English:* Musk Mallow—; *Fanti:* Orsangmangkrongma—; *French:* Abelmosc, Ambrette, Gombo musqué, Graine de musc, Guimauve veloutée, Herbe musguée, Ketmie odorante—; *French Guiana:* Ambrette, Calalou musqué—; *German:* Ambre, Ambrette, Bisorn—; *Gujerati:* Mushakdana—; *Hindi:* Mushkdana—; *Indo China:* Bong trang nui, Bong

vang, Nhan sam, Vong vang—; *Italian:* Ambretta—; *Malay:* Kapas hantu, Kapas hutan—; *Malayalam:* Kasturiventa, Kattukasturi—; *Marathi:* Kasturibhenda—; *New Caledonia:* Adlivigonagahako—; *Pampangan:* Castocastolian—; *Persian:* Mushkdana—; *Roumanian:* Pesma—; *Russian:* Dushishtaya Ketmia, Muskusnaya trava—; *Sakalave:* Tsindraranjaza—; *Sanskrit:* Latakasturika—; *Sinhalese:* Kapukimissa—; *Soussou:* Soumari—; *Spanish:* Abelmosco, Ambarina—; *Tagalog:* Castio, Castiocastiogan, Castiogan, Castoli, Castuli, Dalupan, Putucan—; *Tamil:* Kasturivendai, Kattukkasturi—; *Telugu:* Karpurabenda, Kasturibenda, Nelabenda—; *Urdu:* Mushkadanah—; *Visayan:* Ducum, Marapoto, Maricum, Maropoto, Marucum—; *Wassaw:* Orsangmangkrongma—.

6. **Hibiscus esculentus** Linn. Sp. Pl. (1753) 696.—*Abelmoschus esculentus* (Linn.) Moench Meth. 617; Wight & Arn. Prodr. 53.—PLATE 132.

Hairy, erect, not prickly. Leaves cordate, 3-5-lobed; lobes oblong, coarsely toothed, scabrous; petioles 15 cm. long, hairy; stipules subulate. Pedicels about 2.5 cm. long. Involucral bracts 8-10, deciduous, equalling the calyx. Flowers yellow with purple centre. Staminal tube antheriferous throughout. Fruit pyramidal-oblong, 6-8-ribbed, 7-9 by 2.5-3.2 cm. Seeds striate, hairy.

Distribution: Cultivated throughout India.—Probably of African origin; naturalized or cultivated in all tropical countries.

The mucilaginous fruit is sour and tasty; tonic, astringent, aphrodisiac; it causes "kapha" and "vata"; causes dyspepsia, and produces ozaena; to be avoided in bronchitis (Ayurveda).

The mucilaginous fruit is sweetish; cooling, stomachic, aphrodisiac; enriches the blood; cures biliousness; useful in gonorrhoea and urinary discharges, in stranguary, in diarrhoea; emollient; causes constipation (Yunani).

The plant abounds in a copious mucilage, and is a valuable emollient and demulcent.

The leaves are used to form emollient poultices.

The mucilage from the fruits and seeds is useful in gonorrhoea and irritation of the genito-urinary system.

The immature capsules are employed in the form of a decoction as an emollient, demulcent, and diuretic in catarrhal affections, ardor urinae, dysuria, and gonorrhoea.

In Guinea the fruit and the leaves are used as emollient.

In Guiana the plant is very much used as a cooling mucilage; every part of the plant is considered emollient and employed as such; the fruit boiled in milk is given for cough.

Arabic: Bamiya—; *Ashanti:* Nkurungmang—; *Bambara:* Guaniala—; *Banda:* M'Veke—; *Bengal:* Dhenras, Dheras, Ramtorai— *Bombay:* Bhenda, Chendi—; *Brazil:* Guiabo, Guimgombo—; *Burma:* Younpadisi—; *Canarese:* Bendakainaru, Bende—; *Central Provinces:* Bhendi—; *Ceylon:* Bandakkai—; *Deccan:* Bhendi—; *English:* Edible Hibiscus, Gobba, Gumbo, Lady's Finger, Ochro, Okra—; *Ewe:* Fetri—; *Fanti:* Nkurungmang—; *French:* Bamia, Gombault, Gombeau, Gombo, Ketmie comestible, Mauve comestible, Oka—; *French Guiana:* Calalou, Calou—; *Fulah:* Candie, Taku—; *Ga:* Engmongmi—; *Gujerati:* Bhindu—; *Hausa:* Kubewa, Takeyi—; *Hindi:* Bhindi, Katavandai, Ramturai, Ranturi—; *Konkani:* Bendo—; *Krepi:* Alorkore, Atise, Bodro, Mesairdi—; *Krobo:* Muorming, Pingpesi—; *La Reunion:* Lalo—; *Malayalam:* Vanta—; *Malinke:* Gavu, Gau, Guan—; *Manjia:* Gona, M'Beyi, Yoga—; *Marathi:* Bhenda—; *Mexico:* Chinbombo, Gombo, Quingombo—; *Persian:* Bamiyah—; *Portuguese:* Quiabo—; *Punjab:* Bhindatori, Bhindi, Ramturai—; *Sanskrit:* Asrapatraka, Bhenda, Bhinda, Bhindatika, Chatupunda, Chatushpada, Darivka, Gandhamula, Karaparna, Kshatrasambhava, Pichhila, Sushaka, Tindisa, Vrittabija—; *Sarracole:* Diakatame—; *Sinhalese:* Bandakka—; *Sokoto:* Guro—; *Soussou:* Sulegni—; *Tamil:* Vendai, Vendi—; *Telugu:* Benda, Penda, Venda—; *Twi:* Nkurungmang—; *Urdu:* Bhendi—; *West Indies:* Common Okra, Gombeau, Gombo, Guiabo, Long Green, Okra—.

7. **Hibiscus tiliaceus** Linn. Sp. Pl. (1753) 694; Roxb. Fl. Ind. III, 192.—*Paritium tiliaceum* St. Hil. Fl. Bras. Mer. I, 256; Wight Ic. t. 7.—*Hibiscus tortuosus* Roxb. Fl. Ind. III, 193.—PLATE 133.

A tree; young parts pubescent. Leaves 10-12.5 cm. long,

cordate, roundish-ovate, abruptly acuminate, finely reticulately veined, entire or crenulate; petioles 4-5 cm. long; stipules subulate. Flowers in terminal racemes; peduncles with a small linear deciduous bract at the base; pedicels short, stout. Involucral bracts 10, connate above the middle, lanceolate, acute, shorter than the calyx, tomentose. Calyx 9 mm. long, divided nearly to the base; lobes narrow-lanceolate with a prominent mid-nerve, tomentose. Corolla 5-7.5 cm. across, pubescent outside, yellow in the morning, turning red in the afternoon, centre dark crimson. Staminal tube antheriferous all the way down. Styles connate 4.5 mm. below the stigmas. Capsule 12 mm. diam., globose, with a short beak, spuriously 10-celled, 5-valved, hidden in the persistent calyx, tomentose. Seeds subreniform, black, sulcate.

Distribution: All tropical regions, especially near the coast.

The root is said to be febrifuge, and employed in the preparation of embrocations (Irvine).

The bark yields a dark hairy fibre which is used as an absorbent in Malaya.

In the Philippines the powdered bark is given as an emetic; an infusion of the leaves is employed to wash ulcers and wounds; the flowers, boiled in milk, are used in the treatment of earache.

In the Gold Coast the yellow juice from the young fruits is rubbed on the skin to cure weakness.

In Indo China the leaves are considered laxative and resolvent.

In Madagascar the plant is used as an emollient.

Bengal: Bola, Chelwa—; *Betsimisaraka:* Baro—; *Bombay:* Bellipata—; *Burma:* Thengben, Thinban—; *French:* Bois de flot, Bois de liège, Grand Mahot, Varo—; *French Guiana:* Grand Maho, Maho—; *Ga:* Fairf—; *Hova:* Varo—; *Indo China:* Huu nap, Tra lam chieu—; *Javanese:* Waeu—; *Konkani:* Bellipata—; *La Reunion:* Foulsapate—; *Malay:* Ambaru, Baru, Baru laut, Dedap laut—; *Malayalam:* Nirparutti, Talipparutti—; *New Caledonia:* Borao, Borao de marais, Borao rouge, Bourao, Eemi, Eimi, He, Ven—; *Pampangan:* Balibago, Raquindi—; *Philippines:* Malabayo—; *Sakalave:* Masaizano—; *Sanskrit:* Bala—; *Seychelles:* Bois var—; *Sinhalese:* Beligobel, Belipatta, Bellipatta—; *Swahili:*

Mtakawa—; *Tagalog:* Balibago—; *Tamil:* Nirpparutti—; *Telugu:* Ettagogu—; *Uriya:* Baniya, Bariya, Kurubeli—; *Visayan:* Balabago, Malabago—; *Zulu:* umLolo, umLolwa—.

8. **Hibiscus rosa-sinensis** Linn. Sp. Pl. (1753) 694.—PLATE 134A.

Arborescent; stem without prickles. Leaves short-petioled, ovate or ovate-lanceolate, more or less acuminate, irregularly and coarsely serrate towards the top, entire near the base, glabrous on both sides or with a few minute stellate hairs on the nerves beneath; stipules lanceolate-subulate, glabrous. Pedicels axillary, solitary, very long, as long as, or longer than the leaves, jointed above the middle. Involucral bracts 5-7, about half as long as the calyx, lanceolate, glabrous. Calyx divided almost to the middle, puberulous with very minute stellate hairs, lobes 2 cm. long, lanceolate. Corolla 7.5 cm. diam., tubular below, red; petals thrice as long as the calyx. Staminal tube exserted far beyond the petals.

An extremely variable species. There are single and double forms and as to colour the flowers may be orange, yellow, crimson, bright red, magenta, and parti-coloured.—No fruits produced in India.

Distribution: Cultivated in gardens throughout India.—Native country probably China.

The buds have a sweet odour and bitter taste; cooling, astringent; remove burning of the body, urinary discharges, seminal weakness, piles, uterine and vaginal discharges; promote the growth of the foetus; cause vomiting and intestinal worms. The flowers fried in ghee check excessive menstruation (Ayurveda).

In Bombay, the roots are dried and sold in the shops as a substitute for *Althoea.* In the Konkan, the fresh root-juice of the wild flower variety is given for gonorrhœa, and the powdered root for menorrhagia.

The root is valuable in coughs.

The leaves are considered emollient and aperient.

The flowers are considered emollient, and an infusion of the petals is given as a demulcent and refrigerant drink in fevers.

The flowers are a household remedy in the Philippine Islands. Externally they are used in all kinds of inflammation; internally they are prescribed in the form of decoction in bronchial catarrh as a bechic and sudorific.

In La Reunion the flowers are considered emmenagogue.

Aqueous and alcoholic hydrochloric acid extracts of the petals have been examined for: (1) their absorption spectra; (2) their colour reaction towards sodium acetate, sodium bicarbonate, and sodium hydroxide; (3) their dyeing properties towards wool and cotton (T. R. Seshadri; 18th Ind. Sc. Congress, Nagpur, 1931).

Arabic: Angharaehindi—; *Bengal:* Jiwa, Joba, Juwa, Oru—; *Bombay:* Jasavanda—; *Burma:* Kaungyan, Koungyan—; *Canarese:* Dasavala, Dasavana, Dasanihu, Kempupundrika Nadeya—; *Cantonese:* Ch'uen Kan—; *Chinese:* Ch'uan Chin, Fu Sang—; *Deccan:* Gudel, Jasum, Jasut, Kudhal—; *English:* Shoe Flower—; *French:* Ketmie de Cochinchine, Rose de Chine—; *Gujerati:* Jasuva—; *Hindi:* Jasum, Jasut—; *Ilocano:* Cayanga—; *Indo China:* Dam but, Dok mai, Hong can, Phu tang—; *Konkani:* Doxini—; *Malaya:* Choon Kin—; *Malayalam:* Ayamparutti, Jampa, Japa, Shemparatti—; *Marathi:* Dasindachaphula, Jasavanda, Jassvandi—; *Nasirabad:* Badshapashand—; *Pampangan:* Cayanga, Gomamila, Tapolanga, Tapuranga, Tarocanga—; *Persian:* Angaraehindi—; *Philippines:* Cayaga, Gumamela, Tapulaga—; *Portuguese:* Flor de sapato—; *Sanskrit:* Arkapriya, Aruna, Harivallabha, Japapushpa, Java, Joba, Odhrapushpa, Ondrakhya, Pratika, Raktapushpi, Rogapushpi, Rudrapushpa, Trisandhya—; *Sinhalese:* Sapatthumal—; *Spanish:* Rosa de China—; *Tagalog:* Antolangan, Aroganan, Cayanga, Gomamila, Tapolanga, Tarocanga—; *Tamil:* Arattam, Irattaichegappuchembarattam, Irattaimanjajembarattam, Mandaram, Sapattuppu, Sembarattai, Sevarattai, Sivandavessai—; *Telugu:* Dasanamu, Dasani, Japapushpamu—; *Tulu:* Dasanapu—; *Uriya:* Mondaro, Odophulo, Onghribollika—; *Visayan:* Antolangan, Aroganam, Cayanga, Gomamila, Tapolanga, Tapuranga, Tarocanga—.

9. **Hibiscus lampas** Cav. Diss. III (1787) 154, t. 56, f. 2.—

Thespesia lampas Dalz. & Gibs. Bomb. Fl. (1861) 19.—*T. macrophylla* Blume Bijdr. (1825) 73; Cooke Fl. Bomb. I, 114.—PLATE 135 (under *Thespesia lampas* Dalz. & Gibs.)

A shrub, 7.5-10 cm. high. Leaves 7.5-15 cm. long, cordate or truncate at the base, 3-lobed; lobes triangular, acuminate, finely reticulately veined, sometimes with black glandular dots on the lower surface, subglabrous on the upper; petioles 3.8-9 cm. long. Peduncles 7.5-10 cm. long, axillary, 3-flowered; pedicels 6-12 mm. long. Involucral bracts 5, small, subulate, fugacious. Calyx cupular, truncate, persistent; teeth subulate, 0.8-12 mm. long. Corolla 7.5 cm. diam., yellow with crimson centre. Capsules 2.5 cm. long, ovoid, pointed, 4-5-valved, pilose. Seeds glabrous.

Distribution: Himalaya up to 4,000 ft., Bengal, Burma, W. India (Konkan, Kanara, W. Ghats up to 3,000 ft.) N. Circars, Deccan, Ceylon.—Java, E. tropical Africa.

The root and fruit are used in Chota Nagpur as a remedy in gonorrhœa and syphilis (Campbell).

Assam: Bonkapash—; *Bengal:* Bankapas—; *Canarese:* Adavibende, Turuve—; *Gujerati:* Paruspiplo—; *Hindi:* Bankapas, Kakhi—; *Lepcha:* Kaphalmuk—; *Malayalam:* Daraba, Kattuparatti—; *Marathi:* Janglibhenda, Ranbhendy—; *Mundari:* Birkadsom, Birkaksom, Birkarsom, Birkaskom, Birkasom, Birkatsom—; *Pangasinan:* Banaro—; *Porebunder:* Adbauparuspiplo, Jangliparuspiplo—; *Ramnagar:* Bankapasi—; *Santal:* Bonkapsi—; *Tagalog:* Banagapula, Bannago—; *Telugu:* Adavibende, *Adavi*-pratti, Bharadvaji, Kondapatti, Pagadipatti, Pattinga—; *Uriya:* Bonokopa—; *Visayan:* Bannago, Bulacan—.

10. **Hibiscus trionum** Linn. Sp. Pl. (1753) 697.

Annual, more or less clothed with stellate hairs. Leaves 2.5-3.8 cm. long, palmately divided to the base (the lower leaves sometimes orbicular and undivided); lobes usually 3, again variously lobed and toothed; petioles 2.5-3.8 cm. long; stipules subulate, clothed with long stiff hairs. Pedicels axillary, longer than the petioles, jointed near the flower. Involucral bracts 8-12, linear-subulate, less than half as long as the calyx, ciliate with long hairs rising from thickened bases. Calyx divided above the middle; lobes broadly

ovate, acute, membranous, with many hispid tortuous nerves, which are green at first, afterwards turning purple. Corolla 1.3 cm. diam., yellow with a purple spot at base. Capsules oblong, obtuse, pubescent. Seeds rounded on the back, dotted with minute, stellate pubescence.

Distribution: Southern Europe and the tropics of the Old World.

In China and Malaya an infusion of the flowers is taken for itching and painful skin diseases, and as a diuretic. The dried leaves are held to be stomachic.

Cantonese: Wo Sheung T'au—; *Chinese:* Ho Shang T'ou—; *Malaya:* Woh seong tow—.

11. **Hibiscus surattensis** Linn. Sp. Pl. (1753) 696.

Erect or trailing; branches slender, sparsely covered with recurved prickles. Leaves up to 5 cm. long, from orbicular, or ovate, acute, to palmately 3-5-lobed, with a more or less truncate base, crenate-serrate; petioles 2.5-3.8 cm. long, prickly; stipules broad, leafy, ear-shaped, toothed, ciliate. Pedicels prickly, longer or shorter than the petioles. Involucral bracts 9-12, each consisting of a prickly stalk 1.3 cm. long, carrying a spathulate apiculate leaf-like appendage 8 mm. long, prolonged downwards into a linear toothed ciliate spur 1.3 cm. long. Calyx membranous, deeply divided; lobes ovate, acuminate, the tips often armed with stout recurved prickles, with coloured mid- and marginal- nerves and hairy, sometimes prickly, margins. Corolla yellow, centre dark purple. Capsules ovoid, hairy.

Distribution: Tropical Asia, Africa, Australia.

The mucilaginous flowers are much used as an emollient and pectoral in La Reunion.

The Zulus use a lotion of the leaf and stem for the treatment of penile irritation of any sort, including venereal sores and urethritis. It is sometimes applied as an ointment for the same purposes. An infusion is also used as an injection into the urethra and vagina for gonorrhoea and other inflammations.

Betsimisaraka: Sirangabalala—; *Bombay:* Ranbhendy—; *Burma:* Welmachinpoung—; *La Reunion:* Oseille malabare—;

Malaya: Assam susor—; *Sinhalese:* Hinnapiritta, Naapiritta—; *Tamil:* Kashlikirai—; *Telugu:* Mulugogu—; *Visayan:* Labog—; *Zulu:* inCathucathu—.

12. **Hibiscus manihot** Linn. Sp. Pl. (1753) 696.—*H. pentaphyllus* Roxb. Hort. Beng. (1814) 52.

A large annual erect hairy plant, 1.2-1.8 m. high; stems with small scattered prickles. Leaves 9 cm. long, scabrid with short stiff hairs, cordate, serrate, acutely angled or more or less palmately 5-7-lobed; lobes again variously divided, usually acuminate; petioles 5-12.5 cm. long, prickly. Stipules 1 cm. long, linear-lanceolate, with stiff bristles on the margins. Pedicels less than 2.5 cm. long, axillary and clustered at the ends of the branches, stout, sometimes with a few prickles. Involucral bracts 4, longer or shorter than the calyx, 1.3-2 cm. long, ovate-lanceolate. Calyx softly villous, within and without, ovoid, acuminate in bud, 2.2 cm. long; sepals connate to the very tip, splitting down one side. Corolla 5-7.5 cm. across, yellow with purple centre. Capsules 3.8 cm. long, ovoid, 5-angled, hispid, cuspidate. Seeds faintly pubescent.

Distribution: Bengal, Mt. Abu, Gujarat, Konkan, W. Ghats, W. coast from S. Kanara to Travancore.

In Indo China the bark is considered emmenagogue. It is used in the form of mucilage.

Chinese: Huang Shu K'uei, Shu Kuei—; *Ga:* Lagalaga—; *Indo China:* Hoang thuc quy—.

13. **Hibiscus mutabilis** Linn. Sp. Pl. (1753) 694.

A small tree without prickles. Branches tomentose. Leaves cordate, long-petioled, suborbicular, 5-7- lobed or- angled, irregularly crenate-dentate, often entire near the base, more or less softly pubescent or tomentose; stipules linear-lanceolate. Pedicels 10-12.5 cm. long, jointed near the flower, axillary, solitary. Involucral bracts 7-10, linear-lanceolate, shorter than the calyx. Calyx-lobes ovate, acuminate, velvety-pubescent. Corolla 7.5-10 cm. across, spreading, white or pink in the morning, turning red before night; petals almost

twice as long as the calyx. Staminal tube shorter than the corolla. Capsules globose, flattened, hairy. Seeds reniform, hispid.

Distribution: Cultivated in India.—Indigenous in China.

In Malaya and China the flowers are an established remedy for pectoral and pulmonary complaints; they are prescribed as a stimulant. The leaves are applied to swellings.

In Guiana the plant is used as an emollient.

Bengal: Sthalpadma, Thulpadma—; *Canarese:* Neladavare, Suryakanti—; *Chinese:* Fu Jung, Mu Fu Jung—; *French Guiana:* Caractĕre des dames, Rose changeante—; *Hindi:* Guliajaib, Shalapara-Sthalkamal—; *Indo China:* Moc phu dung, Phu dung—; *La Reunion:* Passe-rose—; *Malaya:* Foo yoon—; *Malayalam:* Chinapparatti, Hinaparutti—; *Philippines:* Mapola—; *Portuguese:* Amor inconstante, Rosa mudavel—; *Punjab:* Guliajaib—; *Sanskrit:* Padmacharini, Sthalpadma—; *Tamil:* Irattaivellaichembarattam, Sembarattai—; *Uriya:* Sthalopidmo, Tholopodmo—.

THESPESIA Soland.

Trees or erect shrubs. Leaves entire, or angularly lobed. Inflorescence axillary, solitary or racemose. Involucral bracts 5, deciduous, or O. Calyx truncate, 5-toothed. Staminal tube toothed at the apex. Ovary 4-5-celled; cells few-ovuled; styles club-shaped at the apex, 5-furrowed, or subdivided into erect club-shaped short stigmatiferous branches. Capsule loculicidally dehiscent or almost indehiscent. Seeds glabrous or pubescent. Cotyledons much folded, usually glandular with black dots.—Sepcies 5.—Warm countries.

Practically every part of the plant is employed externally in various cutaneous affections.

T. populnea Corr. is used medicinally in Indo China, the Malay Archipelago, the Society Islands, Mauritius, Mozambique, and Upper Guinea; *T. campylosiphon* Rolf. is used in the Philippine Islands.

1. **Thespesia populnea** Soland. ex Correa in Ann. Mus. IX (1807) 290.—PLATE 136.

A small tree. Leaves 7.5-15 cm. long, broadly ovate, cordate, acuminate, entire, smooth, finely reticulately veined, with 5-7

prominent nerves and often a glandular pore in one or more of the intercostal spaces beneath, sometimes with a few minute peltate scales on one or both surfaces; petioles 5-10 cm. long; stipules subulate, deciduous. Pedicels 5-7.5 cm. long, axillary, shorter or longer than the petioles. Involucral bracts 0 or 5, lanceolate, shorter than the calyx, caducous. Calyx cupular, truncate, covered with minute peltate scales; teeth minute, sometimes obscure. Corolla 5-7.5 cm. diam., yellow with purple base. Capsules globose, 2.5 cm. diam., covered with minute peltate scales, surrounded at the base by the persistent calyx. Seeds 1 cm. long, ovoid, channelled along the back, pubescent.

Distribution: Coast forests of India and Burma, largely grown as a roadside tree in tropical regions.

The root is acrid; the fruit sour, acrid and sweet; difficult to digest; produce worms in the intestine and increase " kapha "; aphrodisiac; remove " vata " and " pitta "; and burning of the body; good for heart diseases and throat troubles (Ayurveda).

In the Central Provinces, the root is taken as a tonic.

In the Konkan, the flowers are employed in the cure of itch; and the leaves are employed as a local application to inflamed and swollen joints.

The fruit yields a yellow, viscid juice, which forms a valuable local application in scabies and other cutaneous diseases. The affected parts of the body are daily washed with a decoction of the bark.

A decoction of the bark is given internally as an alterative.

The bark is astringent and is prescribed in the Philippines for the treatment of dysentery in the form of a decoction. The fruit, leaves, and root are applied externally in scabies and other skin affections.

In Tahiti, the fresh capsules, bruised and applied to the forehead are said to cure migraine; the yellow sap exuding from the peduncles is considered a cure for the bites of insects, especially of the centipede; it is also useful in sprains, bruises, and all cutaneous affections. In Mauritius, the bark is described as depurative, as used in dysentery, haemorroids; the juice of the fruits being applied to warts.

In Madagascar a decoction of the bark is commonly used in chronic dysentery and cutaneous diseases; the sap is applied externally for herpes.

Rumphius speaks highly of the value of the heartwood as a remedy for bilous attacks and colic, and in a kind of pleurodynia from which the Malayas often suffer.

Waring tried the bark in scabies and other cutaneous diseases; in some cases, it exercised a favourable influence, but in the majority it was productive of little or no benefit.

The leaves are ground into a paste and applied externally in children's eczema; so also an oil prepared by boiling the ground bark in cocoanut oil is applied externally in psoriasis and scabies. The contents of the fruit which is a capsule are applied externally to ringworm. A decoction of the bark is given internally in skin diseases. The ground leaves and contents of the capsule applied externally in eczema and ringworm respectively were found to be useful. A compound oil of the bark and capsule was given in cases of urethritis and gonorrhoea with beneficial results (Koman).

Ahanta: Tamsi—; *Bengal:* Gajashundi, Palaspipal, Parash, Parespipal, Porash, Prash—; *Bombay:* Bhendi, Bhindi, Palaspiplo, Parsipu—; *Canarese:* Arasi, Bangali, Bugari, Gandarali Huvarasi, Jogiyarale—; *Central Provinces:* Ranbhendi—; *Ceylon:* Karavachu—; *Deccan:* Paraspippal, Paris—; *English:* Portia Tree, Tulip Tree, Umbrella Tree—; *Ewe:* Borborsenya—; *Fanti:* Adormba, Frefi—; *French:* Porcher—; *Ga:* Adengkra, Fairtsho, Foz—; *Gujerati:* Bendi, Bhindi, Parasapiplo—; *Hindi:* Bhendi, Gajadanda, Gajhanol, Parashajhad, Paraspipal, Parsipu, Pipal, Porush—; *Hova:* Valo—; *Indo China:* Chrey sramol, Tra bo de, Tra bua, Tra lam vo—; *Konkani:* Benddy, Maner—; *La Reunion:* Porcher—; *Malay:* Baru, Buah Keras laut—; *Malayalam:* Chandamaram, Chilanti, Kallal, Puppa-rutti, Puvarasu, Puvvarasha—; *Marathi:* Bendi, Bhenda, Bhendi, Paraspipar, Parsachajhada, Ranbhendi—; *New Caledonia:* Bois de rose, Daleni, Kabaoui—; *Nzima:* Eijan—; *Porebunder:* Paraspiplo—; *Portuguese:* Pau rosa, Pau de rosa—; *Punjab:* Paharipipal, Paraspipal—; *Sakalave:* Valomena—; *Sanskrit:* Gardabhanda, Kamandalu, Kandarala, Kapichuta, Kapitana, Kuberaksha, Kundah, Nandi, Parisha, Phalisha, Suparshvaka—; *Sinhalese:* Gansurigaha, Suriya, Suriyagaha—; *Sunderbunds:* Dumbla—; *Tagalog:* Baboigubat, Babuy, Banalo, Boboigubat, Bubuygubat, Malasantol, Malibago—;

Tamil: Kallal, Piram, Pupparutti, Puvarasu—; *Telugu:* Gangaravi, Gangareni, Munigangaravi—; *Tulu:* Jogi, Jogiyattasa—; *Twi:* Ayedru, Benorsenye—; *Uriya:* Gunjausto, Porosopippoli—; *Visayan:* Bulacan—.

Gossypium Linn.

Erect herbs or shrubs, sometimes subarboreous. Leaves 3-9-lobed, rarely entire. Involucral bracts 3, large, usually cordate, incised, toothed or entire, sprinkled with black dots. Calyx truncate or shortly 5-toothed, sprinkled with black dots. Staminal tube bearing numerous filaments below the naked, or very rarely, antheriferous apex. Ovary 5-celled; cells many-ovuled; style club-shaped, 5-furrowed; stigmas 5. Capsule loculicidally 3-5-valved. Seeds densely clothed with cottony hairs; cotyledons much folded, sprinkled with black dots. —Species 12.—Tropical and subtropical regions.

A. Flowers wholly yellow or yellow with purple base. Involucral bracts laciniate.
- I. Cotton adherent to the seeds.
  - a. Seeds with underlying down .... 1. *G. herbaceum.*
  - b. Seeds with firmly adherent towny down underlying cotton of the same colour or white .... 4. *G. hirsutum.*
- II. Cotton easily separable from the seeds .... 3. *G. barbadense.*

B. Flowers wholly purple or yellow with purple base. Involucral bracts subentire or toothed, not laciniate .... 2. *G. arboreum.*

The root bark increases the contraction and tonus of the uterus.

The following are used medicinally:—in the Philippine Islands—*G. arboreum* Linn., *G. barbadense* Linn., *G. herbaceum* Linn., *G. perenne* Linn.—; in Cochinchina and China—*G. herbaceum* Linn., in North America—*G. barbadense* Linn., *G. herbaceum* Linn., *G. hirsutum* Linn.—; in Porto Rico—*G. racemosum* Poir.—; in Peru —*G. peruvianum* Cav.—; in Brazil—*G. barbadense* Linn.—; in Guiana—*G. barbadense* Linn., *G. herbaceum* Linn.—; in Guinea—*G. hirsutum* Linn.—.

Official:—Seeds of *G. herbaceum* Linn. (Portugal); hairs of seeds of *G. barbadense* Linn. (Austria, Russia), *G. hirsutum* Linn. (Russia), *G. herbaceum* Linn. (Austria, Russia); hairs of seeds of *Gossypium spp.* (Austria, Belgium, France, Germany, Great Britain,

Holland, Italy, Japan, Portugal, Spain, Sweden, Switzerland, Turkey, United States); oil of seeds of *Gossypium spp.* (United States); root bark of *Gossypium spp.* (Great Britain).

1. **Gossypium herbaceum** Linn. Sp. Pl. (1753) 693 (partim); Watt. Wild & Cult. Cott. 79, 155-63, pl. 24, 25; in Kew Bull. (1926) 208; Cooke Fl. Bomb. I, 116 (partim).—PLATES 137 & 138.

Twigs, petioles and peduncles round, green, sparsely pilose conspicuously gland-dotted but in some forms the stems, etc., become purple and the dots inconspicuous. Leaves almost reniform, distinctly cordate-auriculate, leathery, glabrescent on maturity, often prominently reticulate, blade less than half cut into 3-5-7 lobes; the lobes broad, ovate, rotund, suddenly acute or apiculate, irregular below thinly pilose and with the sinuses thrown up in folds; stipules long, linear, acuminate; glands on the veins below, sometimes appearing on more than the central one (an evidence very possibly of hybridism). Bracteoles green, broadly ovate-rotund, obtuse, only very slightly united but prominently cordate, gashed across the top into 7-9 fairly long irregular teeth, which decrease right and left. Inflorescence proliferous, forming many lateral spurs that carry two or more flowers, sometimes almost becoming "clustered"; stipules of the small leaves of the spurs elliptic acuminate. Flowers not very large but about twice the length of the bracteoles, yellow with purple claws. Calyx large, loose, undulate, or with short rounded teeth.

Distribution: Cultivated in the N.-W. Frontier Province, Baluchistan.—Afghanistan, Persia, Mesopotamia, Syria, Egypt, Mediterranean, U. States of America. Probably indigenous in N. Arabia and Asia Minor.

The flowers are sweet, cooling, tonic, galactagogue; remove biliousness and "kapha"; allay thrist, dispel hallucinations and wandering of mind; restore consciousness. The leaves remove "vata"; enrich the blood, increase the flow of urine, and cure all ear troubles. The seeds are galactagogue and aphrodisiac. All parts of the plant are used in the treatment of skin diseases, uterine discharges, snake-bite, and scorpion-sting (Ayurveda).

The flowers are tasteless, slightly bitter; a syrup is prescribed in

all forms of insanity, in hypochondria; a poultice is applied to burns, scalds, scabies; a fomentation is recommended for burning eyes; analgesic; good for all kinds of inflammation. The seeds are aphrodisiac, expectorant, and laxative; used in orchitis. The juice of the leaves is good in dysentery; the leaves with oil are applied as a plaster to gouty joints (Yunani).

In India, the cotton seeds are employed to procure abortion. They are considered a nervine tonic, and are given in headache. They are used as a galactagogue.

The herbaceus parts contain much mucilage and are used as a demulcent.

The juice of the fresh leaves is considered very efficacious in the treatment of snake-bite.

The root and the leaves are recommended for the treatment of scorpion-sting (Yogaratnakara, Brihannighantaratnakara Nighantaratnakara, Subodha-vaidyaka).

In Annam, the flowers are given in amenorrhœa and dysmenorrhoea; the oil from the seeds is applied to wounds, and used in scabies and herpes.

In North America, the root bark is used in large doses as an abortifacient. The seeds are considered antidysenteric and galactagogue. The juice of the leaves is administered as an emollient in diarrhoea and in mild forms of dysentery.

In South America, cotton-seeds in the form of decoction are employed in the treatment of intermittent fevers.

In Cambodia, every part of the plant is used medicinally. The whole plant is considered febrifuge; the flowers and leaves pectoral and antiphlogistic; the roots astringent, antidysenteric, diuretic, and emollient.

The leaves are not an antidote to snake venom (Mhaskar and Caius). Neither the root nor the leaves have any effect in the symptomatic treatment of scorpion sting (Caius and Mhaskar).

The germ of the plant contains both betaine and choline. The flowers yield a glucosidal pigment, gossypetin. The colouring matter

of cotton flowers has been studied by A. G. Perkin (*Journ. Chem. Soc.*; 1909, 1913, 1916).

Annam: Bong se, Bong tau, Cat boi, Cay bong, Cay bong lam vai, Cay vai bong, Thao Khoang—; *Arabic:* Fitan, Kurtamussul—; *Bengal:* Kapas, Tula—; *Bombay:* Kapas, Rui—; *Burma:* Wa, Wah—; *Cambodia:* Krabas—; *Canarese:* Ambara, Arali, Badari, Dudi, Hatti, Karihariyale, Karpasa, Tula—; *Deccan:* Kapas—; *English:* Common Cotton, Indian Cotton—; *French:* Cotonier, Cotonnier herbacé, Cotonnier de Malte—; *Gujerati:* Kapas, Ru—; *Hindi:* Kupas, Rui—; *Indo China:* Bong, Fai, Krabas, Mien hoa, Thao mien—; *Konkani:* Kapsini, Kapus—; *Malayalam:* Badara, Karppas, Karppasi, Karuparutti, Kuruparatti, Pangni, Paritti, Parutti, Pishu, Tulam, Tundikeri—; *Malta:* Common Cotton, Indian Cotton, Short stapled Cotton, Cotone, Koton Malti, Koton ta Malta—; *Mundari:* Kadsom, Karsom, Kaskom, Kasom, Katsom—; *Pampangan:* Balaccastila—; *Persian:* Pambah—; *Portuguese:* Algodao, Algodoeiro—; *Punjab:* Rui—; *Roumanian:* Bumbac—; *Russian:* Hlopchatnik—; *Sakalave:* Tsiahilika—; *Sanskrit:* Anagnika, Badara, Chavya, Chhadana, Guda, Kalakanta, Karpasasarini, Karpasi, Maghani, Marudbhava, Patada, Patahena, Pichu, Samudranta, Sutrapushpa, Tula, Tundakerika, Tundikeri, Vadara—; *Sind:* Vaum—; *Spanish:* Algodonero—; *Tagalog:* Bulac, Bulag—; *Tamil:* Iladambarutti, Karbasam, Karppasam, Panji, Pari, Parutti, Samuttrandam, Taiparutti, Tulam, Tulavam, Uppambarutti, Uttiri, Vanapparutti—; *Telugu:* Badari, Badarika, Edudi, Karpasamu, Patti, Pinja, Pishulamu, Pishuvu, Pratti—; *Tulu:* Parti—; *Uraon:* Kabsi—; *Uriya:* Karpaso, Kopa, Korpaso—; *Urdu:* Rui—; *Visayan:* Cadaba, Candaba, Gapas—.

2. **Gossypium arboreum** Linn. Sp. Pl. (1753) 693; Watt. Wild & Cult. Cott. (1907) 77, 81-91, pl. 7, 8; in Kew Bull. (1926) 194.—PLATE 139.

Leaves broad, ovate-cordate, acute thick, glabrescent, $^2/_3$ rds palmately 3-7-lobed; lobes curvilinear, bristle-tipped, sinuses between the lobes open and often carrying extra teeth within. Bracteoles ovate, acute, entire or toothed on the apex. Flowers purple with darker coloured claws. Calyx truncate or only slightly 5-angled and

prominently gland-dotted. Corolla nearly three times the length of the bracteoles. Seeds with a greenish coloured fuzz, in the purer forms.

Distribution: Grown in gardens and about temples.

In Bombay, the root is used in the treatment of fever.

In the Konkan, the root, rubbed to a paste with the juice of patchouli leaves, has a reputation as a promoter of granulation in wounds; and the juice of the leaves, made into a paste with the seeds of *Vernonia anthelmintica*, is applied to eruptions of the skin following fever. In Pudukota, the leaves ground and mixed with milk, are given for strangury.

The petals squeezed and soaked in human or cow's milk, are used as a soothing and effective application for conjunctivitis of infants.

The cotton is a very useful external remedy in burns, scalds, and some other surgical diseases. The seeds exercise some good influence over gonorrhoea, gleet, chronic cystitis, consumption, and some catarrhal affections. The fresh young capsules and shoots have been observed to produce good effects in some cases of dysentery and gonorrhoea. The control of the seeds over gonorrhoea and gleet is more manifest when combined with some other drugs.

Bombay: Deokapas—; *Bundelkhand:* Boojali, Nurma—; *Burma:* Nuwa—; *Canarese:* Hanji, Karihatti—; *Central Provinces:* Deo, Mannua—; *Dacca:* Borailly—; *English:* Tree Cotton—; *French:* Cotonnier arborescent—; *Hausa:* Abduga, Auduga—; *Hindi:* Deokapas, Nurma—; *Malayalam:* Chemparutti—; *Marathi:* Devakapusa—; *Mysore:* Deokurpas—; *North-Western Provinces:* Manua, Nurma, Radhia—; *Punjab:* Kapas—; *Sanskrit:* Karpasamu—; *Santal:* Bhogakuskom, Budikaskom—; *Sokoto:* Kada—; *Spanish:* Algodonero arboreo—; *Tagalog:* Balacnabundoc, Bulcanatotoo—; *Tamil:* Sembarutti—; *Telugu:* Patti—; *Visayan:* Bulacngabisaya—.

The following variety is cultivated in Gujarat and Kathiawar:

Var. *neglectum* Watt. l. c. 77, 95-108, pl. 10, 11, 12; in Kew Bull. (1926) 195.

Leaves very hairy, coarse, bullated, rough furrowed or

corrugated; lobes 3, 5 or 7, often with supplementary teeth, linear-lanceolate, undulate, the bottom pair spreading. Bracteoles very large, greatly produced laterally, more than half the length of the corolla. Flowers often two together, usually yellow with purple claws.

In hybrid states the flower tends to become white or pink with purple claws.

3. **Gossypium barbadense** Linn. Hort. Upsal. I (1748) 204; Sp. Pl. (1753) 693.

A much-branched shrub reaching 1.5-2.4 m. high, glabrous or the young parts more or less pubescent. Leaves cordate, black-dotted, the midrib or the 2 lateral nerves with a gland, deeply 3-5-lobed; lobes acuminate; petioles rather long, slender; stipules linear-lanceolate. Pedicels short, stout, often glandular at the top, axillary, solitary. Involucral bracts very large, deeply laciniate. Corolla yellow with purple base. Capsules 3-5-celled, ovoid, acuminate. Seeds free or coherent, black, covered with readily separable cotton, without any underlying down.

Distribution: Cultivated.

The seeds, in the form of an emulsion, are given in dysentery and are supposed to be pectoral. They yield by expression an oil which is much used to clear the skin of spots and freckles.

A tea made of the young leaves is recommended in lax habits, and for preparing a vapour bath for the anus in cases of tenesmus.

Betsimisaraka: Hasina, Landihazo—; *Burma:* Noowah—; *Canarese:* Karihatti, Vilayatihatti—; *Gambia:* Duloboro—; *La Reunion:* Gros coton—; *Madras:* Parutti—; *Malayalam:* Chemparutti—; *Philippines:* Canton, Pernambuco—; *Sanskrit:* Maghani, Purvam—; *Tamil:* Arattam, Mayiliyam, Sembanju, Sembarutti, Simaipparutti—; *Telugu:* Ettappatti, Paidipatti, Pamidipatti—; *Uriya:* Rongokopa—.

4. **Gossypium hirsutum** Linn. Sp. Pl. ed. 2 (1763) 975, var. *religiosa* Watt, Wild and Cult. Cott. (1907) 201-4, t. 32, 33.

Perennial, diffuse. Leaves hairy, 3-5-lobed; lobes triangular, acute; stipules cordate, acuminate. Involucral bracts large, deeply laciniate. Corolla uniformly yellow or yellowish white. Capsules

4-5-celled, oblong, much pointed. Seeds free, with firmly adherent tawny down; underlying cotton of the same colour or white; cotton not easily separable from the seeds.

Distribution: Cultivated.

In Guinea, the seeds and the leaves are considered emolient, the roots emmenagogue.

The leaves and flowers (deprived of the petals) contain the glucoside quercimeritrin; while the petals contain both quercimeritrin and isoquercitin (Viehoever, Chernoff, and Johns; *Journ. Agric. Research*, 1918).

Fulah: Hotollo—; *Malinke:* Koroni—; *Malta:* Koton ta Gallipoli—; *Soussou:* Guessefonte—.

KYDIA Roxb.

Trees with stellate hairs. Leaves ovate, entire or lobed. Flowers in terminal panicles, polygamous. Involucral bracts 4-6, connate at the base, spathulate-oblong, exceeding the calyx, spreading in fruit, persistent, brown. Sepals 5, connate below the middle, ovate, incurved over the fruit. Petals 5, obcordate; filaments united in a tube a little more than half their length, then divided into 5 spreading branchs, each carrying 3 subsessile anthers; variously reduced or wanting in the carpellate flowers. Style-branches 3, each carrying a large peltate stigma. Ovary 2-3-celled; ovules 2 in each cell. Capsule globose, woody, at length loculicidally dehiscent. Seed usually 1 in each cell, reniform-ellipsoid, brown-black.—Species 2.—Indian.

K. calycina Roxb. is used medicinally.

1. **Kydia calycina** Roxb. Hort. Beng. (1814) 51; Corom. Pl. III (1819) 12, t. 215; Wight Ic. t. 879, 880.—*K. roxburghiana* Wight Ic. t. 881.—*K. fraterna* Roxb. Corom. Pl. III (1819) t. 216.—PLATES 140, 141A, 141B, 141C (Pl. 141C under *K. fraterna* Roxb.).

A tree. Leaves 7.5-15 cm. long, palmately 7-nerved cordate, usually 3-7-lobed; lobes often angular, the mid-lobe the longest, glabrous above, hoary tomentose beneath; petioles 2.5-5 cm. long. Panicles many-flowered, clothed with dense tawny tomentum; pedicels

9 mm. long. Involucral bracts 4-6 strongly nerved, accrescent, 6-9 mm. long, in fruit. Corolla white or pink; petals emarginate, exceeding the calyx, clawed, with a tuft of hairs at each side of the base of the claw. Staminal tube hairy at the base; filaments longer in the male than in the carpellate flowers. Capsule loculicidally 3-valved, about the size of a very small pea, covered with mealy tomentum, globose, top slightly umbonate. Seeds reniform, striate, brown-black.

Distribution: Tropical Himalaya from the Indus eastwards, Burma, Satpuras, W. Peninsula along the Ghats, Konkan and N. Kanara in deciduous forests, Deccan hills of the Poona District, in the Madras Presidency in most districts of the N. Circars and Deccan in deciduous forests, scarce on the W. Coast.

Among the Santals, the leaves are pounded and made into a paste and applied to the body for pains. They are also chewed, when there is a deficiency of saliva (Campbell).

Almora: Pata—; *Bhil:* Bothi—; *Bijnor:* Palao, Pattra—; *Bombay:* Motipotari, Varanga, Varangada, Varung—; *Burma:* Bokemaiza, Dwabote, Dwalok, Myethlwa, Tabo—; *Canarese:* Belagu, Bellaka, Bende, Bendenaru, Bendi, Billulhendi, Kadubende, Kolibende, Nayibende—; *Central Provinces:* Baranga, Bargha, Bhotti—; *Garhwal:* Pillu, Pulao—; *Garo:* Boldobak—; *Gond:* Bosha, Buruk, Kunji—; *Gujerati:* Mhotihirwani, Nihotilirwani—; *Hasada:* Bitabororo—; *Hindi:* Choupultea, Patha, Pola, Potari, Pula, Puli, Pulipatha, Pulu—; *Kharwar:* Derki—; *Khond:* Wala—; *Kolami:* Bittia, Gonyer, Patadhamin—; *Konkani:* Varang—; *Lambadi:* Charpili—; *Lepcha:* Dansasiyok, Sedangtaglar—; *Malayalam:* Velukku, Venta—; *Marathi:* Bhendi, Bhoti, Iliya, Potari, Varung—; *Mechi:* Mahow, Moshungon—; *Nepal:* Kubinde—; *North-Western Provinces:* Puta, Puttiya—; *Oudh:* Kakahi—; *Porebunder:* Mhotihirwani—; *Punjab:* Pola, Pula, Pulli—; *Ramnagar:* Pula—; *Sadani:* Baranga, Bicra, Jhari—; *Santal:* Poshkaolat—; *Saora:* Erukutada, Pulan—; *Shan:* Dwabok—; *Tamil:* Vendai—; *Telugu:* Kondapotari, Pachabotuka, Pandiki, Peddakunji, Peddapotari, Potari—; *Uriya:* Bharimo, Khopashya—.

BOMBACACEAE.

Trees, sometimes with bulging stems through excess of water storage. Leaves alternate, simple or digitate, often lepidote, deciduous; stipules deciduous. Flowers hermaphrodite, regular medium or large, showy. Calyx cup-shaped, closed and valvate in bud, truncate or irregularly 3-5-lobed, with slightly imbricate lobes, often subtended by an epicalyx. Petals 5, imbricate, often elongated, sometimes absent. Stamens free or united into a tube, opposite the petals; anthers reniform to linear; pollen smooth. Ovary superior, 2-5-celled, free; style simple, capitate or lobed; ovules 2 or more on the inner angle of each cell. Capsule loculicidally dehiscent or indehiscent, the valves rarely falling away. Seeds often embedded in hairs from the wall of the fruit, with little or no endosperm and flat or contorted or plicate cotyledons.—Genera about 21, species about 150.—Widely distributed in the tropics.

A. Calyx 5-cleft .... ADANSONIA.
B. Calyx truncate or irregularly 3-5-lobed.
  I. Branches of the staminal tube.
    1-antheriferous .... BOMBAX.
  II. Branches of the staminal tube.
    2-3-antheriferous .... CEIBA.

Mucilaginous and emollient; some bitter and astringent.

A bitter principle, adansonin, has been isolated from *Adansonia digitata* Linn.

ADANSONIA Linn.

Trees with a low trunk of great diameter. Leaves digitate; leaflets 3-9; quite entire. Pedicels axillary, 1-flowered. Involucral bracts 2. Flowers large, pendulous. Calyx ovoid or oblong, deeply 5-fid, silky-villous within. Petals 5. Staminal tube dividing above into numerous longish 1-antheriferous filaments; anthers reniform. Ovary 5-10-celled; cells many-ovuled; style shortly divided at the apex into as many spreading stigmatic branches as there are cells to the ovary. Fruit oblong, woody; cells packed with farinaceous pulp. Seeds reniform, nesting in pulp; hilum lateral; testa thick; albumen

thin, membranous; embryo curved. Cotyledons much contortuplicate, enclosing a slightly curved radicle.—Species 10.—Palaeotropic.

Emollient and resolvent, antidysenteric and antiperiodic.

A. digitata Linn. is used medicinally in whatever country it is found growing. *A. gregorii* F. Muell. is similarly used in North Australia and *A. madagascariensis* Baillon in South Africa.

The presence of potassium bitartrate in the fruit of ADANSONIA is at present a subject of controversy.

1. **Adansonia digitata** Linn. Sp. Pl. (1753) 1190.—*Baobabus digitata* O. Ktze Rev. Gen. I (1891) 67.

Trunk of great diameter at base, rapidly narrowing upwards. Leaves deciduous, glabrous; leaflets 5-12.5 cm. long, obovate-oblong, acute or obtuse; petioles up to 15 cm. long, villous; petiolules 0-5 mm. long. Pedicels reaching 20 cm. long, softly hairy. Calyx tawny-tomentose outside, grey silky-villous within, divided below the middle; lobes 5 cm. long, oblong-lanceolate. Ovary densely villous; style up to 10 cm. long, lower part villous.

Distribution: Grown in many places in India.—Indigenous in tropical Africa.

The fruit is sweet, bitter, cooling, antipyretic; useful in biliousness, vomiting, dysentery, excessive perspiration (Ayurveda).

The dried leaves in powder form have been found serviceable in diarrhoea, fevers, and other maladies.

The pulp is beneficial in pyrexia of any form of fever, by diminishing the heat and quenching thirst.

In Bombay, the pulp, mixed with butter-milk, is used as an astringent in diarrhoea and dysentery. In the Konkan, the pulp with figs is given in asthma, and a sherbet made of it, with the addition of cumin and sugar, is administered in bilious dyspepsia.

The bark was used in Europe as a febrifuge, and as a substitute for cinchona bark.

In Guinea and in Senegal the acid flour from the fruit is used in dysentery and diarrhoea. The leaves are considered emollient, maturant, diuretic and febrifuge, and widely empolyed. The seeds are cooked, ground, and given in toothache and gingivitis. The latex

is used for the same purposes as the seeds. The inner fibrous part of the shell is made into a decoction and used as an emmenagogue.

In the Gold Coast the bark is used instead of quinine for curing fever. The cream of tartar surrounding the seeds is made into a cooling drink in cases of fever. The pulp of the fruit is considered a specific in putrid pestilential fevers.

In Gambia the root is used as a febrifuge.

The tree is used in various animal medicines by the Hausas.

In Central Africa the leaf is used as a diaphoretic and as a prophylactic against fevers, to check useless perspiration, and as an astringent. The fruit is used as a dysentery remedy, and for fevers.

In La Reunion the leaves are given as an emollient in dysentery and inflammatory fevers. The leaves also are considered emollient; they are administered in the form of powder. The pulp of the fruit is used in haemoptysis, dysentery, and diarrhoea.

The leaves and bark abound in mucilage. The bark contains a crystalline bitter principle, adansonin.

Heckel and Schlagdenhauffen have found in the fruit as much as 2 per cent of free tartaric acid and 12 per cent of potassium bitartrate.

Afrikaans: Krimmetatboom—; *Ajmere:* Kalbriskh, Kalpbriskh—; *Akwapim:* Odadeair—; *Arabic:* Babbab, Baobab, Hujed—; *Awuna:* Alagba—; *Bombay:* Choyarichinch, Gorakhaamli, Gorakhchincha, Gorakhchintz—; *Canarese:* Brahmamlika, Magimavu—; *Deccan:* Hathikhattyan—; *Delhi:* Kalbriskh, Kalpbriskh—; *Dutch:* Apenbroodbloom—; *English:* African Calabash, Baobab, Monkey Bread, Sour Gourd—; *Ewe:* Adido, Alagba—; *Fanti:* Efuobrordidua, Efuorbordedwo—; *French:* Azbre de mille ans, Baobab, Baobab d' Afrique, Boabab, Calebassier du Sénégal, Pain de singe, Gros mapou—; *Fulah:* Boha—; *Ga:* Shadzo—; *German:* Adansonie, Boabab—; *Gold Coast:* Cream-of-Tartar Tree—; *Gujerati:* Bukha, Gorakhaamli, Morambali, Rukhdo—; *Hausa:* Kuka—; *Hindi:* Gorakamali, Gorakhamli, Goramlichora—; *Italian:* Baobab—; *Kamba:* Mwamba—; *Krepi:* Dodo—; *Krobo:* Salaitsho, Salo—; *Malinke:* Boki—; *Marathi:* Gorakhchinch—; *Masai:* Ol imisera—; *Morar:* Vilaytiyimbi—; *Porebunder:* Gorokhambali—; *Portuguese:*

Africa: Embondeiro—; *Russian:* Adansonia, Baobab—; *Sakalave:* Sefo—; *Sanskrit:* Chitrala, Choramli, Dirghadandi, Gandhabahula, Gopali, Gorakshi, Panchaparnika, Sarpadandi, Sudandika—; *Soussou:* Kiri—; *South Africa:* Baobab, Cream-of-Tartar Tree, Lemonade Tree, Monkey Bread Tree—; *Spanish:* Baobab—; *Swahili:* Mbuyu—; *Tamil:* Anaippuli, Papparappuli, Perukku, Puri—; *Telugu:* Brahmamlika, Maggimavu, Simachinta—; *Tigre:* Hoemmer, Hoemert—; *Tigrinea:* Dima, Dumma—; *Twi:* Ortortaa, Ortotowa—.

Bombax Linn.

Trees, often lofty. Leaves digitate; leaflets 3-9, subentire. Pedicels axillary or subterminal, solitary or clustered, 1-flowered. Petals 5, narrow or obovate, often pubescent. Calyx cup-shaped, truncate or irregularly 2-5-lobed. Stamens indefinite, inserted at the base of the calyx, adnate to the petals, united into 5 bundles opposite to the petals. Ovary 5-celled; cells many-ovuled; style clavate, 5-gonous or shortly 5-fid. Capsule loculicidally 5-valved; cells very densely wooly within. Seeds obovoid or subglobose, polished or opaque; albumen thin; cotyledons much contortuplicate covering a straight radicle.—Species 60.—Tropics.

Emollient, maturant, and resolvent.

B. ceiba Linn. is used medicinally in China, Cambodia, Malaya, and the Philippine Islands; *B. buonopozense* Beauv. is used in Guinea.

1. **Bombax ceiba** Linn. Sp. Pl. (1753) 511.—*B. malabaricum* DC. Prodr. I (1824) 479.—*B. hetaphyllum* Roxb. Corom. Pl. III, t. 247.—Plate 142 (under *B. malabaricum* DC.).

A tall deciduous tree, with straight buttressed trunk and wide-spreading branches; bark grey, covered with hard sharp conical prickles. Leaves large; leaflets 3-7, entire, 7.5-18 cm. long, glabrous, penninerved, reticulately veined, lanceolate or oval, cuspidate, acute at the base; petioles 20 cm. long, glabrous; petiolules 1.2-2.5 cm. long; stipules small, triangular, caducous. Flowers numerous, near the ends of the branches, appearing before the new leaves. Calyx thick, usually 3-lobed; lobes rounded, densely silky within, glabrous without,

coming away from the receptacle with the stamens and corolla. Corolla bright red, tomentose on the outside, sparingly pubescent within; petals elliptic-oblong, recurved, with close parallel veins. Stamens more than 60, arranged in 5 bundles of about 9-12 each, and an inner bundle of 15 of which the 5 innermost are longest; filaments flattened, slightly pubescent, rather more than half as long as the petals, connate only at the base of the bundles. Ovary conical, glabrous; style a little longer than the stamens; stigmas 5, linear, 6 mm. long. Capsules 10-12.5 cm. long, ovoid, downy, 5-valved, lined within with white silky hairs. Seeds 9 mm. long, numerous, ovoid, packed in white cotton.

Distribution: Throughout the hotter parts of India and Ceylon.—Malaya.

The root is sweet and cooling; demulcent, tonic, slightly diuretic; astringent to the bowels; useful in biliousness, heat of the body, and inflammations. The bark is acrid; demulcent, diuretic, tonic, and slightly astringent; removes "kapha"—. The flowers are bitter, acrid, cooling and dry; astringent to the bowels; remove "kapha" and "pitta"; purify the blood; benefit the spleen; good for leucorrhoea.—The fruit is sweet, flavoury, cooling; digestible; stimulant, diuretic, tonic, aphrodisiac, expectorant; alterative; purifies the blood; exercises a great beneficial influence over the membranes of the genito-urinary organs; good for leprosy.— The gum is acrid; astringent, demulcent, tonic, alterative, aphrodisiac; causes "kapha", removes "vata", good in diarrhoea, dysentery, menorrhagia, leucorrhoea, and blood diseases (Ayurveda).

The gum is bitter; astringent, styptic, aphrodisiac; used in stomatitis, biliousness, diseases of the blood, burning of the body (Yunani).

The gum or dried juice, *mocha-ras*, which the tree yields, is used as an aphrodisiac. It contains a large proportion of tannic and gallic acids, and may be successfully employed in cases requiring astringents. The gum has also tonic and alterative properties, and is used in diarrhoea, dysentery, and menorrhagia.

The dry flowers, with poppy seeds, goats' milk, and sugar, are

boiled and inspissated, and of this conserve two drachms are given three times a day in haemorrhoids (Taylor).

The root has stimulant and tonic properties. The bark and the root are emetic. The young roots, dried in the shade and powdered, form the chief ingredient in the *musla-semul*, a medicine highly thought of as an aphrodisiac; it is also given in impotence.

The roots of saplings up to about three years old are known as "Semarkanda" in the Central Provinces and are used as a nerve tonic and as an astringent.

The flowers and fruit in combination with other drugs are recommended for the treatment of snake-bite and scorpion sting (Sushruta).

In China the flowers are used externally for boils, sores, and itch.

In Cambodia the bark is used as a styptic in metrorrhagia, the root is considered diuretic, and the gum is occasionally administered in water for blennorrhagia.

Neither the flower nor the fruit has any antidotal value against snake (Mhaskar and Caius) or scorpion (Caius and Mhaskar) venoms.

The gum is an astringent, demulcent, and haemostatic. This was tried in two cases of chronic dysentery, in haemoptysis of pulmonary tuberculosis and influenza, haematemesis, malaena and menorrhagia, and acute dysentery with beneficial results. The blood disappeared from the vomited and purged matters in two or three doses of 40 grains each, but in acute and chronic dysentery its action was slow and had to be accelerated by the addition of other drugs like *Holarrhena antidysenterica*, pomegranate rind, etc. (Koman).

Bengal: Roktosimul, Simul, Tula—; *Bhil:* Katseori—; *Bombay:* Saer, Saur, Semul, Shembal, Somr—; *Burma:* Didu, Lepanbin, Letpan—; *Cambodia:* Roka—; *Canarese:* Apurani, Buraga, Burla, Dudi, Elava, Hatti, Kempuburaga, Mullelava, Mulluburaga, Pishphele, Sauri—; *Central Provinces:* Semar, Semur—; *Ceylon:* Parutti—; *Chinese:* Mu Mien—; *Deccan:* Kantonkakhatyan, Kantonkasemul, Lalkhatyan—; *English:* Cotton Tree, Red Silk-cotton Tree—; *French:* Bombax de Malabar, Cotonnier Mapou, Kapokier du Tonkin—; *Garo:* Boichu, Panchu—; *Gond:* Vallaiki—; *Gujerat:* Ratoshemalo, Sauvor, Shemolo, Shimar, Shimlo, Shimul—; *Hazara:* Simbal—; *Hindi:* Kantisembal, Pagun, Ragatsemal, Ragatsembal, Semal, Semul,

Semur, Shimbal, Simal, Somr—; *Indo China:* Gao, Sich moc mien thu—; *Khond:* Kamba—; *Kolami:* Del, Idel—; *Konkani:* Sanvor, Sauvor—; *Kumaon:* Semal, Simol—; *Lambadi:* Chamblero—; *Lepcha:* Sunglu—; *Magahi:* Lapaing—; *Malaya:* Mook min, Simur—; *Malayalam:* Ilavu, Mocha, Mullilavu Pichila, Pula, Purani, Unnamuriku—; *Marathi:* Kanterisamar, Kantesavar, Samar, Savara, Savari, Sayar, Shevari, Simlo, Tamari—; *Mundari:* Edelsanga—; *Nepal:* Simal—; *Portuguese:* Algodoeiro do matto, Arvore de panha, Panheira Sumauma—; *Sanskrit:* Apurani, Bahuvirya, Chirayu, Chirjivi, Dirghadruma, Dirghapadapa, Dirghayu, Duraroha, Kadala, Kalpavriksha, Kantakadruma, Kantakari, Kantakashtha, Kukkutavandaka, Kukkutti, Mahavriksha, Mocha, Mochani, Nirgandhapushpi, Nissara, Pnachaparni, Pichhala, Purani, Raktapushpa, Raktotpala, Ramyapushpa, Salmili, Shalmali, Shalmalini, Shimulu, Sthirayu, Sthulaphala, Tulavriksha, Tulini, Tuliphala, Yamadruma—; *Santal:* Edel—; *Saora:* Buroh—; *Sinhalese:* Kattuimbul—; *Sutlej:* Shirlan *Tagalog:* Bobuygubat, Buboygubat, Malabulac—; *Tamil:* Agigi, Ilavam, Ilavu, Kongu, Mullilavu, Pongar, Pulai, Purami, Sallagi, Samani, Sanmali, Selavagu, Sittan, Surabu—; *Telugu:* Buraga, Kondaburaga, Mundlaburaga, Pinnaburaga, Salmali—; *Tulu:* Ala, Mullala—; *Uriya:* Buro, Mochoroso, Salmali, Simuli—; *Visayan:* Quesero, Salay, Talutu—.

CEIBA Medic.

(ERIODENDRON DC.)

Trees unarmed or with thorns. Leaves digitate; leaflets usually entire. Pedicels 1-flowered, axillary, solitary or clustered. Involucral bracts O. Calyx cup-shaped, truncate or irregularly 3-5-lobed, persistent. Flowers rosy or whitish; petals 5, oblong, slightly connate at the base, pubescent or woolly. Stamens in 5 bundles opposite the petals, connate at base, each bearing 2-3 sinuous or linear anthers. Ovary 5-celled; cells many-ovuled; style cylindric, dilated, stigma obscurely 5-lobed. Capsule woody or coriaceous, oblong, dehiscent by 5 thin deciduous valves, densely woolly within. Seeds obovoid or globose, numerous, enveloped in copious silky cotton; testa

crustaceous, polished; albumen thin; cotyledons contortuplicate.—Species 10.—Tropics, chiefly American.

C. pentandra (Linn.) Gaertn. is used medicinally wherever it is found growing.

1. **Ceiba pentandra** (Linn.) Gaertn. Fruct. II (1791) 244, t. 33.—*Bombax pentandrum* Linn. Sp. Pl. (1753) 511.—*Eriodendron anfractuosum* Dc. Prodr. I (1824) 479.—*E. pentandrum* Kurz in Journ. As. Soc. Beng. XLIII, II (1874) 113; Gamble Fl. Madras (1915) 100. PLATE 143 (under *Eriodendron anfractuosum* DC.).

A tall tree; trunk prickly when young; branches horizontal, in whorls of 3. Leaves glabrous; petioles 10-15 cm. long; leaflets 5-8, lanceolate, 5-12.5 cm. long, cuspidate, entire, glaucous beneath; petiolules 2.5 mm. long; stipules filiform, caducous. Pedicels 2.5-5 cm. long, in clusters of 2-8. Calyx 1.2-2 cm. long, glabrous outside, hairy at the base within, 5-lobed; lobes rounded or triangular, sometimes almost obsolete. Flowers 3.8-5 cm. diam., dirty white, appearing with the young leaves at the ends of the branches; petals twice the length of the calyx, woolly outside. Ovary conical, glabrous. Capsules fusiform, blunt, lined with long white silky hairs. Seeds 6 mm. long or more, pyriform, glabrous, black, enveloped in silky wool.

Distribution: Indigenous in the Andamans, the Malay Archipelago, tropical America, but doubtfully so in the W. Peninsula; often planted.

The gum has a bitter sharp taste; removes " kapha " and " vata ", hot; cures diseases of the liver, spleen, blood; removes tumours, fat, pain; alexitermic (Ayurveda).

The roots and gum are tonic and fattening; antipyretic, diuretic, aphorodisiac; useful in gonorrhoea and painful micturition; good for biliousness and blood complaints. The leaves cure boils and are useful in leprosy (Yunani).

The juice obtained from the roots is considered a most valuable cure for diabetes.

The tree yields a gum which is astringnt and used as a remedy for bowel complaints.

The unripe fruits are regarded as demulcent and astringent.

Samali, Shamieula—; *Nago:* Ogufe—; *None:* Len—; *Nuolof:* Binteguie—; *Nzima:* Enyainga—; *Pampangan:* Bulaccastila—; *Sakalave:* Moraingy, Pamba, Pemba—; *Sanskrit:* Chirayu, Kutashalmali, Kutsitashalmali, Moch, Rochana, Salmali, Shvetasalmali, Sthirayu—; *Sarracole:* Batiugne—; *Sassandra:* Go—; *Savalu:* Guede hunsu—; *Sefwi:* Enya—; *Serere:* Buday—; *Sinhalese:* Imbul, Kottapulung, Pulung, Pulunimbal—; *Soussou:* Konde—; *Tagalog:* Boboy, Bubuy, Bulac, Bulacsino—; *Tagonana:* Serigne— *Tamil:* Ilavam, Karukkanam, Panji—; *Telugu:* Kadami, Tellaburaga—; *Tulu:* Ala—; *Turca:* Blo—; *Twi:* Onyang, Onyina—; *Urdu:* Sambal—; *Visayan:* Daldol—; *Wassaw:* Enyingna—; *Wele:* Tiou—.

STERCULIACEAE.

Herbs, shrubs or trees, the herbaceous parts usually clothed with stellate hairs. Leaves alternate, simple or digitate, entire toothed or lobed, usually stipulate. Flowers usually in axillary cymes, regular, 1- or 2- sexual. Sepals valvate, more or less combined below. Petals 5, hypogynous, free or connate at the base or O. Stamens 5-many; filaments united into a tube or rarely free; anthers 1-5 together, on or between the teeth of or irregularly arranged in one or more whorls on the outside of the tube; cells 2, parallel or diverging, very rarely confluent; staminodes 5 or 10, co-ordinate with the stamens or O. Ovary free, 4-5- (rarely 10-12-) celled or reduced to a single carpel; ovules 2-many (rarely 1) in each cell, attached to the inner angle; styles as many as the cells of the ovary, distinct or connate. Fruit often a 5-valved loculicidal capsule, woody, chartaceous or membranous, sometimes of 1-6 spreading or spirally twisted follicles, rarely dividing into cocci or baccate. Seeds sometimes arillate, occasionally winged; albumen fleshy, thin or O; embryo straight or curved; cotyledons usually foliaceous.—Genera 48.—Species 660.—Chiefly tropical.

A. Follicles woody. Seeds many, winged at the apex, albuminous. Radicle next the hilum .... PTERYGOTA.

B. Follicles coriaceous or woody. Radicle remote from the hilum .... STERCULIA.

C. Flowers subhermaphrodite. Anthers 10. Styles coherent. Stigmas recurved. Follicles 4-6, membranous, opening long before maturity. Seeds solitary, albuminous. Radicle next the hilum .... PTEROCYMBIUM.

D. Anthers 10-15. Stigmas lobed, subcapitate. Follicles large, leafy, boat-shaped, dilated at the base, opening long before maturity. Seeds solitary, albuminous. Radicle next the hilum ... SCAPHIUM.

E. Flowers hermaphrodite. Petals deciduous. Capsule more or less woody, not inflated
- I. Anther-cells divaricate. Seeds not winged .... HELICTERES.
- II. Anther-cells parallel. Seeds winged .... PTEROSPERMUM.

F. Flowers hermaphrodite. Petals deciduous. Androesium tubular, conical, antheriferous for nearly its whole length; staminodes absent .... ERIOLAENA.

G. Flowers hermaphrodite. Petals flat, persistent. Androesium tubular, antheriferous at the margin; solitary or in groups alternating with the staminodes
- Bracteoles caducous. Anthers 15 .... PENTAPETES.

H. Flowers hermaphrodite. Petals macrescent, flat. Androesium tubular at the base only. Stamens 5. Staminodes absent
- Ovary 5-celled .... MELOCHIA.

I. Petals concave at the base. Androesium tubular. Anthers marginal, solitary or in groups between the staminodes
- I. Fertile stamens 5 opposite the sepals .... THEOBROMA.
- II. Stamens uniseriate. Anthers 2-4 between each staminode.
  - a. Petals with a stipitate ovate blade .... ABROMA.
  - b. Petals with a linear bifid blade .... GUAZUMA.
- III. Stamens uniseriate. Anthers solitary between each staminode. Petals with an entire or trifid blade; staminodes short, obtuse .... BUETTNERIA.

Many members of the Order yield gums which resemble in their appearance tragacanth, and are reputed tonic. The fruit is often astringent and antidysenteric; the seeds may be diuretic and have stimulating effect on the central nervous system.

Among the products isolated we may mention:—(1) glucosides—Kolatin—; (2) tannins— Kolatannin—; (3) gums; (4) alkaloids—caffeine, theobromine—; (5) acids—tartaric—; (6) amino-acids—asparagin—; (7) fats and carbohydrates.

OFFICIALS—Theobromine (Austria, Belgium, France, Holland, Italy, Sweden, Switzerland, Turkey);—sodio-salicylate (Austria,

Denmark, Germany, Great Britain, Hungary, Japan, Russia, Sweden, Switzerland, United States).

Cola spp. (Austria, Holland, Russia, Switzerland, Turkey); *C. acuminata* Beauw. (Belgium),—Pal. Beauv. (France),—R. Brown (Austria,—Schott & Endl. (Holland, Italy); *C. nitida* Chev. (Belgium); *C. vera* K. Schum. (Holland).—Schumann (Austria, Italy, Russia, Turkey).

Kola spp. (Hungary); *K. acuminata* Pal. Beauv. (Hungary),—Schot. (Spain); *K. vera* K. Sch. (Hungary).

Theobroma Cacao Linn. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States); *T. Cacao* Linn.=*Cacao sativa* Lamk. (Portugal); *Theobroma spp.* (Spain).

Pterygota Endl.

Trees. Leaves undivided. Flowers in panicles from the axils of fallen leaves, 1-sexual or polygamous. Calyx deeply 5-partite. Petals 0. Staminal column cylindric bearing 4-5 phalanges of about 5 anthers each in male flowers, and staminodes round the base of the ovary in female flowers. Ovary of 5 sessile carpels; ovules numerous; styles short, recurved; stigma 2-lobed. Fruit of 5 large, globose or obovoid, follicles, hard and woody, opening when ripe only with 1 valve. Seeds about 40, furnished with an oblong-obovate wing attached to the margin of the valve; albumen adhering to the cotyledons; radicles small, superior.—Species 4.—Tropics of the Old World.

The genus is therapeutically inert.

1. **Pterygota alata** R. Br. in Benn. Pl. Jav. Rar. 234.—*Sterculia alata* Roxb. Hort. Beng. (1814) 50; Corom. Pl. III, t. 287.

A tall tree; trunk straight; bark smooth, ash-coloured (not white); young parts covered with dense golden stellate pubescence. Leaves crowded about the ends of the branches, falling before the flowers appear, 10-25 by 7.5-18 cm., ovate, cordate, acute or shortly acuminate, glabrous on both surfaces, 3-7-nerved; petioles 5-8.8 cm. long, terete, subglabrous; stipules minute, subulate. Flowers about 2.5

cm. across, in subpanicled few-flowered racemes from the old axils below the leaves; pedicels short; bracts ensiform, caducous. Calyx campanulate, divided almost to the base; lobes 5 (rarely 6), valvate, thick and fleshy, linear-lanceolate, coated without with dense ferruginous stellate down, striate within with red and yellow veins. Male flowers: Staminal-column slender, three-fourths the length of the lobes of the calyx, bearing 5 or 6 very small sterile ovaries at its apex, round which are arranged 4-5 phalanges of subsessile stamens; pollen smooth, yellow. Female or hermaphrodite flowers: Ovaries 5, sessile; ovules numerous; styles very short, pilose recurved; stigma 2-lobed. Staminodes or stamens round the base of the ovary. Follicles 5, subglobose, about 12.5 cm. diam., on stalks 3.8 cm. long, hard and woody, clothed with mealy pubescence without, corky within. Seeds about 40, oblong, compressed, furnished with a corky oblong-obovate wing, which, with the seed, is about 7.5 by 3.8 cm.; cotyledons not separable from the mealy albumen; radicle small, close to the hilum.

Distribution: Chittagong, Pegu, Andamans, W. Peninsula.

In Sylhet the seeds are used as a substitute for opium.

Assam: Tula—; *Burma:* Letkope—; *Canarese:* Bekaro, Jaynkatala—; *Chittagong:* Buddhanarikella—; *Malayalam:* Anattonti, Porila, Porutonti—; *Tamil:* Anaittondi, Kodaittondi—.

STERCULIA Linn.

Trees. Leaves undivided, lobed or digitate. Inflorescence paniculate (rarely racemose), usually axillary. Flowers unisexual or polygamous. Calyx 4-5-fid or partite, usually coloured. Petals O. Staminal column bearing at its apex 10-30 anthers arranged in a ring or without order. Carpels of the ovary 5, subdistinct; ovules 2-many in each carpel; styles connate at the base; stigmas as many as the carpels, free, radiating. Ripe carpels distinct, follicular, sessile or stalked, woody or membranous. Seeds 1-many, naked or rarely winged, sometimes arillate; albumen bipartite, adhering to the cotyledons; cotyledons flat or slightly undulate, thin or fleshy; radicle near to, or remote from the hilum.—Species 100.—Tropical.

A. Leaves digitate .... 1. *S. foetida.*
B. Leaves palmately lobed .... 2. *S. urens.*
C. Leaves simple, not lobed, 1-nerved
Calyx-lobes narrow, incurved, frequently cohering at the tips, gaping at the sides
1. Leaves pubescent beneath .... 3. *S. balanghas.*
2. Leaves with the nerves rusty-hispid beneath ...... 4. *S. rubiginosa.*

Most of the species yield gums in considerable quantity, most of which resemble tragacanth in their appearance and properties.

The following are used medicinally in Japan—*S. javanica* R. Br.—; in the Philippine Islands—*S. balanghas* Linn., *S. foetida* Linn., *S. oblongata* R. Br., *S. rubiginosa* Vent., *S. stipularis* R. Br., *S. urens* Roxb.—; in Indo China—*S. hypochroa* Pierre, *S. lychnophora* Hance, *S. platanifolia* Linn., *S. foetida* Linn., *S. thorelii* Pierre—; in Malay—*S. scaphigera* Wall—; in China—*S. platanifolia* Linn.—; in West Africa—*S. tomentosa* Guil. & Perr., *S. tragacantha* Lindl.—; in Australia—*S. acerifolia* A. Cun., *S. diversifolia* G. Don., *S. rupestris* Benth.—; in Brazil—*S. chicha* St. Hil., *S. striata* A. St. Hil. & Naud.—.

1. **Sterculia foetida** Linn. Sp. Pl. (1753) 1008.—PLATES 144 & 145.

A large tree; bark whitish, flaking off; branches whorled, horizontal. Leaves digitate, crowded at the ends of the branches; leaflets 5-9, subsessile, 10-18 by 3.8-5 cm., oblong-lanceolate, acute or acuminate, tapering to the base, pubescent when young, glabrous on both surfaces when mature; petioles 15-23 cm. long terete, grooved; stipules caducous. Flowers 2.5-3.8 cm. diam., in erect racemose panicles 15-20 cm. long, formed immediately under the young leaves; pedicels 2-2.5 cm. long, jointed above the middle. Calyx deeply divided; lobes linear-oblong, subacute, spreading, much longer than the tube, slightly pubescent outside, woolly inside. Male flowers: Staminal column 9 mm. long, curved, hairy at the base, bearing 10-15 anthers. Female flowers: Carpels 5 downy; gynophore stout, 6 mm. long. Stamindoes subsessile, in a ring beneath the carpels. Styles deflexed, hairy. Follicles 1-5 (commonly 3), 10-12.5 cm. long, boat-shaped, shortly beaked, thick and woody, bright red when ripe, nearly glabrous without, quite glabrous within. Seeds numerous, 2 cm. long,

ovoid-oblong, the back with a small yellow caruncle on one side at the base.

Distribution: Konkan, forests of the W. coast of the Madras Presidency at low elevations, Ceylon, Upper Tenasserim, Martaban, Malay Peninsula.—E. tropical Africa, Philippines, N. Australia.

The oil from the seeds is a mild laxative and is used as a carminative. The seeds when swallowed incautiously bring on nausea and vertigo.

The leaves are repellent and aperient.

A decoction of the fruit is mucilaginous and astringent.

In Java the fruit is employed in gonorrhoea.

Bombay: Junglibadam, Pun—; *Burma:* Hlyampyu, Letkok, Shawbyu, Showbju—; *Canarese:* Bhatala, Bhutaili, Gotinakayi, Jenukayitaili, Kuduregotu, Penari—; *French:* Arbre puant, Bois caca, Bois de cavalam, Bois de merde, Bois puant—; *Goa:* Junglibaddam, Kuomhad, Virhoi—; *Hindi:* Jangalbadam, Janglibadam—; *Ilocano:* Bangar—; *Indo China:* Chim chim rung, Trom—; *Jolo:* Caumpang—; *Konkani:* Cunvemruc, Viroi—; *Malay:* Kelompang—; *Malayalam:* Pinari, Pottakavalam—; *Marathi:* Goldaru, Janglibaddam, Nagalkuda—; *Muduva:* Kaludaivitte—; *Pampangan:* Calumpan—; *Portuguese:* Puna, Puna bastarda—; *Pulaiya:* Kesalamaram—; *Sinhalese:* Kaditeni, Telambu—; *Tagalog:* Calompan, Calumpag, Calumpang—; *Tamil:* Arali, Attirappidukkan, Kudiraippidukku, Malaittengai, Pinari, Pudagarappanbattai—; *Telugu:* Guttapubadamu, Manjiponaku, Piyyattiponaku—; *Tulu:* Pinari—; *Visayan:* Bobag—;

2. **Sterculia urens** Roxb. Corom. Pl. I (1795) 25, t. 24.—Plate 146.

A large tree; young parts more or less pubescent; trunk erect, straight; bark white, smooth, papery, the outer surface thin, peeling off, the inner coat fibrous and netted. Leaves 20-30 cm. diam., crowded at the ends of the branches, shallowly palmately lobed, glabrous or nearly so above, velvety beneath; lobes 5, caudate-acuminate, base cordate; petioles terete, 12.5-23 cm. long, velvety-tomentose. Flowers yellow, numerous, small, 6-9 mm. diam., the hermaphrodite or female mixed with many males, in much-branched

glandular-pubescent terminal panicles appearing before the leaves at the ends of the branches. Calyx campanulate, hairy on both surfaces; lobes oblong, acute, about as long as the tube, with a small hairy gland at the base of each lobe. Male flowers: Staminal column short; filaments 10. Hermaphrodite flowers: Carpels usually 5, on a short stout gynophore; style short, thick, hairy; stigmas 5. Stamens in a ring round the carpels. Follicles 4-6, ovoid-oblong, 2.5 cm. long, densely pubescent, the pubescence mixed with stinging hairs. Seeds 3-6, oblong, black.

Distribution: Gujarat, Konkan, Deccan, N. Kanara, S. M. Country, dry forests of Madras Presidency, Rajputana, N. and Central India, Chota Nagpur, Burma. Ceylon.

The leaves and tender branches steeped in water yield a mucilaginous extract, useful in pleuro-pneumonia in cattle.

The gum, known as *karai-gond*, is used as a substitute for tragacanth in Bombay.

The Santals consider the gum a useful medicine in throat affections.

In the Philippines the root bark is pounded, made into a poultice, and applied to wounds, and fractures; it is also used in orchitis.

Ajmere: Kalru, Katila—; *Assam:* Hatchanda, Odla—; *Banda:* Kulu—; *Bombay:* Gular, Gulu, Gwira Kadai, Kandai, Kando, Kandol, Kandula, Kawalee, Kullin, Kulu, Pandruka, Sardol, Sardora—; *Canarese:* Bhutali, Kempudaili, Kempudale, Pinari, Punike—; *Central Provinces:* Gulu, Gurlu, Karhar, Kulu—; *Ceylon:* Kavali—; *Deccan:* Kurdu—; *French:* Bois démangeant, Touroutier—; *Gond:* Hittum, Pinoh—; *Gujerati:* Kada, Kagdol, Karai—; *Hindi:* Bali, Gular, Gulu, Kabru, Karrai, Kulu, Tabsi, Tanuku—; *Khond:* Gauduli—; *Kolami:* Feley, Kaunji, Teley—; *Konkani:* Pandruk—; *Kurku:* Takli—; *Malayalam:* Tonti—; *Manbhum:* Keonge—; *Marathi:* Gwira, Kandol, Kandula, Karai, Kavali, Pandruka, Soldawar—; *Monghyr:* Kanaunji, Karaunji, Mogul—; *Mundari:* Burkunda, Gurkaranj, Makchund—; *North-Western Provinces:* Gulli, Kuli—; *Panch Mahals:* Kalauri—; *Porebunder:* Kadai, Kadayo—; *Santal:* Telhec—; *Tagalog:* Banilad—; *Tamil:* Kavalam, Puttali, Sendalai, Sendanakku, Sigapputtanaku, Tanakku, Vellaipputtali—;

Telugu: Ettaponaku, Kavili, Ponaku, Tanuku Tapasi—; *Uriya:* Gudalo, Kavili—; *Visayan:* Banilad—.

3. **Sterculia balanghas** Linn. Sp. Pl. (1753) 1007.

A tree, bark whitish, young parts pubescent. Leaves 7.5-12.5 cm., ovate-oval, rounded at base, shortly acuminate, obtuse, recurved, entire, glabrous and shining above, paler and slightly rough with stellate pubescence beneath, petiole 1.3-2 cm., rough stipules small, acute, hairy, deciduous. Flowers small, 1 cm. diam., on rather long pedicles in stellate-hairy panicles 10-12.5 cm. long, and slightly drooping from ends of branches. Calyx deeply cut, segments linear-lanceolate, remaining connected by their tips, pubescent outside, hairy inside; anthers about 15; follicles 4-5, spreading horizontally, shortly stalked, 9 cm. long, oblong-ovoid, acuminate, very minutely pubescent, brilliant orange-scarlet, pericarp thick, leathery, smooth within. Seeds few, 2.2 cm. long, ovoid, jet black, shining, with a small yellow caruncle at base, embryo large, cotyledons thick, fleshy, endosperm between fleshy and horny.

Distribution: Throughout northern parts of India and Ceylon, Malay Peninsula.

In the Philippines the fruit is considered cooling and laxative.

French: Bois de cavatan—; *Malayalam:* Kavalam—; *Philippines:* Balanghas—; *Sinhalese:* Nawa—.

4. **Sterculia rubiginosa** Vent. Hort. Malm. II, 91 in note.

A tree about 6-9 m. tall. Leaves membranous, obovate-oblong, shortly abruptly acuminate, base narrowed acute, rounded or cordate above glabrous, beneath stellate-pubescent; midrib and 7 to 10 pairs elevated nerves more hairy, 11.5-19 rarely to 30 cm. long, 5-7.5, rarely 15 cm. across; petioles 7.5-38 mm. long, rufous-tomentose. Panicles solitary, axillary pendent 7.5-15 cm. long, rufous-tomentose. Male flowers yellow with pink hairs and 5 dark red blotches at the base inside, widely campanulate, lobes linear-lanceolate. Staminal column longer than the tube; anthers 10, yellow. Female flowers on different sprays of the same tree, lobes of calyx lanceolate, free nearly to the base, hairy with pink and white hairs, except at the base where are 5 pink spots. Gynophore short with 10 anthers at base of pistil.

Ovary villous; styles united. Stigmas 3 or 5, all greenish white. Follicles 5, coriaceous, oblong, shortly beaked, 5 cm. long, 2.5 cm. wide, pubescent outside, crimson scarlet. Seed ellipsoid, blue black.

Distribution: Burma, from Signapore to Penang, Cochin-China, Java, Sumatra.

The fruit is used as a mild laxative.

Tagalog: Nato—.

PTEROCYMBIUM Benn.

Trees. Leaves entire or lobed. Flowers unisexual. Calyx campanulate. Male, staminal column tall with 8 or 10 sessile anthers in a ring. Female, with abortive anthers, otherwise as in male, and 5, rarely 6 pistils on the tip of a column, sessile, distinct. Styles as many, slightly cohering. Stigmas recurved. Carpels 4-6, foliaceous, boat-shaped, unequally bilobed, opening before they are ripe, on short pedicels on a gynophore as long as the enlarged persistent calyx. Seed at base one.—Species 2.—Burma, Nicobars, Malaya.

The genus is therapeutically unimportant.

1. **Pterocymbium javanicum** R. Br. Benn. Pl. Jav. Rar. 219, t. 45.—*Sterculia campanulata* Wall.

Tree 15-21 m. tall, 38-50 cm. through, leafless in flower. Leaves ovate or oblong-ovate acute or acuminate, glabrous above, pubescent or hairy on the nerves beneath or quite glabrous, base cordate or rounded, 10-18 cm. long, 10 cm. wide; petioles 3.8-10.5 cm. long. Panicles 2.5-7.5 cm. long in flower, enlarging very much in fruit. Calyx 1.3 cm. long, glabrous, campanulate, lobes broad lanceolate, 5 mm. long, 2.5 cm. wide, tube as long, coriaceous green, edges velvety. Stamen-column as long as the sepals; anthers linear curved. Follicles membranous 3-6 on a gynophore as long as the enlarged sepals, with pedicels pubescent, 1.3 cm. long, boat-shaped, 5-7.5 cm. long, with 2 lobes, the lower broad, rounded, the upper one linear obtuse, 1 cm. wide, glabrous. Seed 1 cm. long, ellipsoid.

Distribution: Malay Peninsula, Burma, Nicobars.—Java, Philippines.

The gum resembles tragacanth.

Burma: Tshaw—; *Malay:* Kluet, Kulunot—.

SCAPHIUM Endl.

Large trees with coriaceous leaves and panicles of small unisexual flowers usually tomentose. Calyx tubular, often very short. Staminal column stalk short or long; anthers in a globose head 10-30, narrow. Female flowers, ovaries 3-5; style short. Carpels very large, thin, membranous, green, boat-shaped, with a single ellipsoid seed at the base.—Species 4.—Martaban, Malay Peninsula, Borneo.

1. Leaves 15-20 by 10-12.5 cm. .... 1. *S. affine.*
2. Leaves 30-35 by 15 cm.. .... 2. *S. wallichii.*

S. wallichii Schott & Endl. is used medicinally in China and Indo-China.

1. **Scaphium affine** Ridley Journ. Roy. As. Soc. S. Br. 73, p. 144.—*Sterculia affinis* Mast. in Hook.f. Fl. Brit. Ind. I, 360.

Tree 18-24 m. tall. Leaves coriaceous glabrous, oblong or oblong-ovate, obtuse, shortly acuminate, base rounded (lobed when young); nerves elevate beneath, 6 pairs, reticulations conspicuous, 12.5-18 cm. long, 5.5-8 cm. wide; petioles 7.5-9 cm. long, thickened at apex. Panicles axillary, 15-18 cm. long, red-tomentose. Branches numerous 6.3 cm. long. Flowers numerous, green, very small. Bracts ovate, woolly. Calyx 2.5 mm. long, tube very short, lobes 4, ovate, minutely scurfy, as long as the tube. Anther-head nearly sessile, with a very short glabrous stalk; anthers 12, minute, glabrous. Follicles 1-5 on pubescent stalks 1.3 cm. long, green, membranous, 15-20 cm. long, glabrous Seed 1, ovoid, brown, 1.3-2.5 cm. long.

Distribution: Malay Peninsula.

Ohe fruit acts as a demulcent.

Malay: Kembang semangkok, S'ilayer—.

2. **Scaphium wallichii** Schott & Endl. Melet 33 (1832).—*Sterculia scaphigera* Wall. Cat. 1130.—PLATE 147 (under *Sterculia scaphigera*).

A tree, all parts glabrous; bark greyish brown, 1.2 mm. thick, peeling off in irregular concave pieces; cut reddish, very fibrous; leaves oblong to ovate-oblong, obtuse or rounded and strongly 3-nerved at base, bluntish acuminate, on a 3.8-7.5 cm. long petiole, 12.5-20 cm.

long, entire, coriaceous, glabrous; flowers 9-10 cm. diam., on very short and thick puberulous jointed pedicels, forming rather short, robust, much-branched puberulous panicles at the end of the thick branchlets; calyx almost rotate, usually deeply 5-cleft, pale orange or yellowish with a reddish base, in bud greyish puberulous, finally sparingly stellate-puberulous, glabrous inside, the lobes oblong-lanceolate, acute; gynophore slender, curved, glabrous; anthers about 10-15; follicles 15-20 cm. long, boat-shaped, open already in flower, herbaceous, turning chartaceous, much nerved and veined, more or less puberulous outside and shortly greyish tomentose on the nerves and short stalk; seed solitary, the size of a cherry, obovoid or almost globose, exalbuminous.

Distribution: Chittagong, Tenasserim, Pegu Yoma, Martaban.

The fruit is used in China as a remedy for dysentery.

In Cambodia, Siam, and Malaya the fruit is macerated in water, when the outer shell or pericarp increases enormously in volume forming a large gelatinous mass. The jelly is sweetened and eaten as a delicacy, and is said to be a specific in diarrhoea and dysentery.

Chinese: Ta Hai—; *Malaya:* Kembang, Semangkok, Tai hoi—; *Siam:* Bungtalai—.

Helicteres Pluck. ex Linn.

Trees or shrubs, more or less stellately pubescent. Leaves entire or serrate. Flowers axillary, solitary or fascicled. Calyx tubular, 5-fid at the apex; lobes often unequal. Petals 5, equal, or somewhat 2-lipped with long claws which sometimes have ear-shaped appendages. Staminal-column elongate, adnate to the gynophore, 5-toothed or 5-lobed at the apex; anthers in groups at the top of the column between its teeth; cells divergent, sometimes confluent. Ovary at the top of the column, 5-lobed, 5-celled; ovules many in each cell; styles 5, subulate, more or less united, slightly thickened and stigmatose at the tips. Follicles spirally twisted or straight. Seeds tubercled; albumen scanty; cotyledons leafy, folded round the radicle which is next the hilum.—Species 45.—Tropics of both hemispheres.

Leaves emollient.

The following species are used medicinally in Indo China and the Philippine Islands—*H. isora* Linn.—; in Brazil—*H. brevispina* A. Juss. in St. Hil., *H. corylifolia* Nees and Mart., *H. ovata* Lam., *H. sacarolha* A. Juss. in St. Hil., *H. vuarame* Mart.—.

1. **Helicteres isora** Linn. Sp. Pl. (1753) 963; Wight Ic. t. 180.—Plate 148.

A shrub or small tree; young shoots clothed with stellate hairs. Leaves bifarious, 7.5-12.5 by 5-10 cm., oblong, obovate or roundish, cordate, suddenly and shortly acuminate, closely dotted on both surfaces with stellate hairs, more or less irregularly crenate-serrate; petioles 6-9 mm. long; stipules subulate, 6 mm. long. Flowers 2.5-3.8 cm. long, distinctly bilabiate, in axillary clusters of 2-6 together; pedicels very short, stellately tomentose; bracts small, subulate, hairy. Calyx tubular, 2 cm. long, somewhat 2-lipped, stellately pubescent without, curved, laterally compressed, mouth wide; teeth triangular, unequal. Petals red at first, fading to lead colour, very unequal, closely reflexed on the calyx, separate but with the claws closely hooked together. Staminal column fused with the gynophore, much exserted, suddenly deflexed; anthers 10, in a ring round the ovary. Ovary conical, on a curved gynophore 3.8 cm. long; style as long as the ovary, deflexed. Follicles 5, beaked, 5-6.3 cm. long, linear, twisted together into the form of a screw, stellately tomentose. Seeds numerous, angular; testa loose, wrinkled.

Distribution: From the Punjab and Bengal to Ceylon, Burma.—Malaya, Australia, W. Indies.

The root and bark are expectorant, demulcent, astringent to the bowels, antigalactagogue; lessen griping; a cure for scabies when applied topically (Yunani).

The juice of the root is said to have a beneficial effect in empyema and stomach affections. In the Konkan it is used in diabetes, and is a favourite cure for snake-bite.

The bark is used in diarrhoea and dysentery.

The fruits are made into a liniment for sores of the ear, and they are administered internally for colic. They are demulcent, mildly

astringent, and useful in the griping of bowels and flatulence of children.

The root and bark are used by the Santals for the same purposes as the fruit.

The leaves are employed in Jamaica for decoction for clysters (Murray).

Neither the bark nor the root is an antidote to snake venom (Mhaskar and Caius).

Arabic: Altwaallatu—; *Banwara:* Anteri—; *Bengal:* Antamora, Atmora—; *Bombay:* Kawun, Kevana, Kewan, Khiran—; *Burma:* Khungiche, Thuguaykhyae, Thungeche—; *Canarese:* Bhutakarulu, Edamuri, Kadukalnaru, Kaiyuri, Kavargi, Murudi, Narukolu, Thunshulla, Yadamuri—; *Central Provinces:* Bottuka—; *Deccan:* Dhameenee, Dhamni, Kevan, Kewanne, Maradsing, Marorikephalli—; *Godaveri:* Itah—; *Gond:* Aita—; *Gujerati:* Murdasing—; *Haldwani:* Benwa—; *Hindi:* Bhendu, Jonkaphal, Kapasi, Maraphali, Marorphali, Marosi—; *Indo China:* Cay do tron—; *Kharwar:* Aiteni—; *Khond:* Kavali—; *Kolami:* Renta, Sakomsang—; *Konkani:* Kivani—; *Kumaon:* Marorphal—; *Kurku:* Koributa—; *Lambadi:* Moldaphaliro—; *Madras:* Valambiri—; *Malay:* Mori—; *Malayalam:* Ishvaramuri, Kaivalanara, Kaiyuna, Valampiri—; *Marathi:* Kewan, Muradsing—; *Monghyr:* Ainthiadhamin—; *North-Western Provinces:* Bhendu, Marorphal—; *Persian:* Kishtburkisht, Pechaka—; *Porebunder:* Anted, Antedi—; *Punjab:* Kupasi, Marorphali—; *Saharanpur:* Kapasi—; *Sanskrit:* Avartani, Mrigashinga—; *Santal:* Petchamra—; *Sind:* Vurkatee—; *Sinhalese:* Liniyagass, Zimiagaha—; *Tamil:* Vadampiri, Valamburi, Valampuri, Valumberi—; *Telugu:* Adasamanti, Adasyamali, Gubadarra, Gubalada, Kavanchi, Nulitada, Nuliti, Peddasamanti, Sadala, Samanti, Syamali, Tada, Uttrasi, Valambiri—; *Tulu:* Kaiycli, Muriga—; *Uriya:* Kaval, Modimodi, Murimuri, Orola—; *Urdu:* Marorphali—.

PTEROSPERMUM Schreb.

Trees or shrubs, scaly or stellately tomentose. Leaves coriaceous, often oblique, entire or more or less angled or toothed above, penninerved. Peduncles axillary, short, 1- or few- flowered. Flowers

often very long; bracts usually 3, entire, laciniate, or O. Calyx tubular, 5-fid or 5-partite, deciduous. Petals 5, obovate, oblong or linear, deciduous. Staminal column adnate to the gynophore, bearing 15 fertile stamens and 5 staminodes, the fertile stamens in groups of 3 between the staminodes; anthers stipitate, linear, erect, cells parallel. Ovary inserted within the apex of the column, 5-celled; ovules many in each cell; style entire; stigma 5-furrowed. Capsule woody or coriaceous, ovoid or oblong, terete or angled, loculicidally 5-valved. Seeds ascending, produced above into a wing; albumen thin or 0; cotyledons corrugated or folded; radicle inferior.—Species 20.—Tropical Asia.

A. Bracteoles linear, entire, very caducous
   Leaves 5-15 by 2.5-5 cm. .... 1. *P. suberifolium.*
B. Bracteoles laciniate or palmately divided.
   1. Leaves 25-35 by 15-30 cm. .... 2. *P. acerifolium.*
   2. Leaves 10-15 by 5-9 cm. .... 3. *P. heyneanum.*

The genus is of little therapeutical value.

1. **Pterospermum suberifolium** Lam. Tab. Encyc. et Méth. III (1823) 136, t. 576.—Plate 149.

A small tree; young parts covered with a light-buff stellate tomentum. Leaves distichous, 6.3-10 by 3-4.5 cm. oblong or obovate-oblong, acuminate, often irregularly angled towards the apex, glabrous above, clothed with a cream-coloured tomentum beneath, oblique and rounded at the base; petioles 6 mm. long, tomentose; stipules small, caducous. Flowers fragrant, white, 3.8-5 cm. across, axillary; buds oblong, prominently 5-ribbed; pedicels thick, jointed, tomentose; involucral bracts 3, a little distant from the flower, entire, bi- or tri- fid, caducous. Calyx divided to the base; sepals linear, subacute, reflexed, stellately tomentose outside, hairy within. Petals slightly shorter than the sepals, lanceolate-oblong, distantly spangled with stellate hairs on the outside when young. Stamens connate into a short tube at the base; anthers linear. Ovary densely silky-villous; ovules 4 in each cell. Capsules 3.8-6.3 cm. long, ovoid-oblong, tapering at both ends, covered with fine white tomentum. Seeds with a broad terminal wing, twice as long as the seed.

Distribution: N. Circars, Deccan in Mysore, Coimbatore, Cuddapah and N. Arcot, up to 3,000 ft., Nellore coast. Planted sometimes in the Bombay Presidency.

The flower has a sharp bitter taste; removes "kapha"; biliousness, blood impurities; cures bronchitis, throat complaints, skin diseases, leprosy, headache, inflammations, sores; improves the voice (Ayurveda).

The flower made into a paste with rice water forms an application for hemicrania.

In the Konkan the flowers and bark are charred and mixed with kamala and applied in suppurating small-pox.

Bengal: Muchkand, Muchukunda, Muskunda—; *Bombay:* Muchunda, Muchukunda—; *Burma:* Naji—; *Canarese:* Muchukunda—; *Ceylon:* Vinanku—; *Hindi:* Muchkand—; *Konkani:* Munchund—; *Madras:* Madri—; *Marathi:* Muchkund—; *Sanskrit:* Arghyarhalakshanaka, Bahupatra, Chitraka, Dirghapushpa, Harivallabha, Kshatravrikha, Muchukunda, Mundivrikshanukaraka, Prativishnuka, Raktaprasava, Sudala, Supushpa—; *Sinhalese:* Velenge, Venangu, Welanga—; *Tamil:* Sembolavu, Sittilaipolavu, Tadai, Vennangu—; *Telugu:* Lolagu, Narudu, Tada—; *Uriya:* Baelo, Giringa, Guputi, Gureno—.

2. **Pterospermum acerifolium** Willd. Sp. Pl. III (1800) 729.—Plate 150.

A large tree; bark smooth, ash-coloured; young parts clothed with floccose pubescence. Leaves variable in shape and size, 25-35 by 15-30 cm., orbicular or oblong, entire or variously lobed, cordate and sometimes peltate, at length glabrous above, clothed beneath with whitish floccose tomentum; petioles 10-30 cm. long, terete, tomentose; stipules multifid, caducous. Flowers fragrant, white, axillary, solitary or in pairs; involucral bracts multifid, caducous. Sepals up to 10 cm. long, linear-oblong, obtuse, densely tomentose outside, villous in a broad line within. Petals linear-oblong, somewhat obliquely cuneate, slightly shorter than the sepals. Staminodes club-shaped. Ovary oblong, 5-angled, 5-celled; ovules 12-20 in each cell. Capsules 10-15 cm. long, oblong, 5-angled, clothed outside with furfuraceous pubescence. Seeds obliquely ovoid, compressed; wing large, thin. The ripe fruit remains for a long time on the tree.

Distribution: Sub-Himalayan tract and Outer Himalayan valleys and hills up to 4,000 ft., Bengal, Chittagong, Khasia Hills, Manipur, Tenasserim, Burma, N. Kanara, extensively planted in the Bombay Presidency.—Siam.

The flower is sharply bitter, acrid; tonic, laxative, anthelmintic; removes "kapha"; inflammation, blood troubles, abdominal pain, ascites; cures ulcers, leprosy, urinary discharges, and tumours (Ayurveda).

The down on the leaves is used to stop bleeding in wounds.

The flowers are used as a general tonic.

In the Konkan the flowers and bark, charred and mixed with kamala, are applied in suppurating small-pox.

Bengal: Kanakchampa—; *Bombay:* Kanakchampa, Karnikara—; *Burma:* Thamajamwaisoke, Toungpetwun—; *Canarese:* Kanakachampaka, Rajataru—; *Hindi:* Kanakchampa, Kaniar, Kathachampa—; *Jaunsar:* Mayeng—; *Konkani:* Kanokchampo—; *Lepcha:* Seeemkung(?)—; *Magahi:* Gaik—; *Michi:* Laider—; *Nepal:* Hattipaila—; *Philippines:* Bayoc—; *Sanskrit:* Karnikara, Mushukunda, Padapotpala, Parivyadha—; *Santal:* Machkunda—; *Tamil:* Vennangu—; *Telugu:* Matsakanda—; *Uriya:* Konokochompa, Mushukundo—.

3. **Pterospermum heyneanum** Wall. Cat. (1828) no. 1169; Wight Ic. 489.

A middle-sized tree; young shoots covered with ferruginous stellate pubescence. Leaves 10-15 by 5-7.5 cm., oblong, acuminate, more or less angled or toothed towards the apex, rounded or subcordate, not or but slightly oblique at the base, glabrous above, grey-pubescent beneath; nerves and veins prominent, clothed with ferruginous pubescence; petioles 6-10 mm. long, rufous-pubescent, attached a little within the margin; stipules ensiform, 13 mm. long. Flowers up to 9 cm. across, white, fragrant; involucral bracts imbricate, subpersistent, foliaceous, broadly ovate, deeply and variously gashed, the segments triangular, acute. Sepals up to 5 cm. long, rufous-pubescent on the outside, villous within. Petals obovate, spreading. Capsules 5 cm. long, narrowed at both ends. Seeds 8-10 in each cell; wing papery, oblique, falcate.

Distribution: W. Peninsula.

The leaves are used in leucorrhoea; they are smoked like tobacco.

Khond: Baili—; *Tamil:* Polavu—; *Telugu:* Duddika, Loluga, Machchakanda, Nolika—; *Uriya:* Bailo—.

PENTAPETES Linn.

Herbs with hastate-lanceolate leaves. Flowers axillary with 3 caducous bracteoles. Sepals 5, lanceolate, persistent, connate at base. Petals 5. Stamens 20, in 5 groups of 3 each, alternating with 5 staminodes, which are nearly as long as the petals. Anthers 2-celled, extrorse. Ovary 3-5-celled, cells many-ovuled; style entire, twisted, thickened upwards, stigmas 5, minute. Capsule loculicidal. Seeds 8-12, 2-seriate in each cell, not winged. Cotyledons plaited, 2-partite. —Species 1.—Indo-Malayan.

1. **Pentapetes phœnicea** Linn. Sp. Pl. (1753) 698.—PLATE 152.

A pretty branched herb, 0.6-1.5 m. high, glabrous or with a few scattered stellate hairs. Leaves long, lanceolate, sharply toothed or crenate-serrate, 7.5-13 cm. long, with only 1 primary nerve. Flowers large, red, nodding on short 2-flowered peduncles. Sepals stellate and bristly. Capsule subglobose, bristly, axis wooly. Seeds subglobose, dotted.

Distribution: Indigenous in N.-W. India, Bengal, Gujarat; planted in many places.

The fruit causes constipation, heats the body, and is difficult to digest; removes "kapha"; cures fever, "vata"; and "pitta" (Ayurveda).

The fruit is mucilaginous. The root is employed as a medicine by the Santals. The plant is used as an emollient in Annam and in China.

Charaka recommends the plant in combination with other drugs for the treatment of snake-bite; but it is useless as an antidotal treatment (Mhaskar and Caius).

Bengal: Bandhuli, Doopahuria, Katlala—; *Gujerati:* Duporio, Sowbhagyasundari—; *Hindi:* Dopahari, Dopohoria—; *Indo China:* Da

lac kim tien, Hoa ti ngo, Ngo thi tra—; *Marathi:* Tambridupari—; *Punjab:* Guldupaharia—; *Sanskrit:* Arkavallabha, Bandhujiva, Bandhujivaka, Bandhuka, Bandhula, Bandhura, Haripriya, Jvaraghna, Madhyadina, Madhyanika, Oshthapushpa, Pushparakta, Rakta, Raktaka, Raktapushpa, Sharatapushpa, Supushpa, Suryabhakta—; *Santal:* Barebaha—; *Tamil:* Nagappu—.

Eriolaena DC.

Trees. Leaves cordate, crenate or serrate, stellately pubescent or tomentose beneath. Peduncles axillary, 1-flowered. Flowers rather large; bracts multisect, laciniate or small and caducous. Calyx 5-fid, or at length 5-partite. Petals 5, deciduous, with dilated tomentose claws; blade flat, glabrous. Staminal column bearing outside many-seriate, 1-antheriferous filaments up to the apex; anthers erect, oblong-linear, cells parallel; pollen globose, muricate. Staminodes O. Ovary sessile, 5-10-celled; ovules many in each cell; style stigmatose at the apex, stellately 5-10-lobed. Capsule woody, dehiscing loculicidally. Seeds ascending, produced above into a wing; albumen thin; cotyledons folded or contortuplicate; radicle next the hilum.—Species 8.—Indo-Malayan.

This genus is therapeutically inert.

1. **Eriolaena quinquelocularis** Wight Ic. III (1847) 7 ubi describit tab. 882 (*Microchloena quinquelocularis* Wight Ic. 882).—Plate 151B.

A small tree. Leaves up to 12.5 by 15 cm., orbicular, cordate, acuminate, coarsely crenate-serrate, dotted with small tufts of stellate hairs above, softly tomentose beneath; petiloes 5-12.5 cm. long, tomentose when young, becoming at length nearly glabrous. Flowers about 5 cm. across, in peduncled, few- (usually 1-3-) flowered cymes near the ends of the branches; involucral bracts a little distant from the flower, minute, entire or with toothed margins, very caducous. Sepals linear-oblong, acute, 2.5 cm. long, pubescent on both surfaces, glandular at the base inside. Petals obovate-oblong, equalling the sepals; claw broad, thick, densely pubescent, deflexed between the sepals. Ovary pubescent; style long, the lower portion hairy; stigma

5-lobed, the lobes revolute. Capsules woody, 3.2 cm. long, pointed, 5-celled, 5-10-valved; valves tubercled, more or less pubescent, usually silky-villous at the inner angle. Seeds numerous, imbricate; wing papery, falcately curved.

Distribution: Bombay Presidency: Konkan, W. Ghats, Deccan, S. M. Country; Madras Presidency: Deccan, Sandur Hills of Bellary, hills of Coimbatore, W. Ghats from Mysore to Travancore at 2,000—4,000 ft.

A poultice made of the roots is said to heal wounds (Wood).

Bombay: Budjari-dha-mun—; *Chota Nagpur:* Bhawat—; *Canarese:* Gomajjige, Kattale—; *Konkan:* Bujaridamu—; *Malayalam:* Vetinar—; *Mundari:* Bunduddaru—; *Tamil:* Malamtutti, Nayunnu Vattanunnu—.

MELOCHIA Linn.

Herbs or shrubs, rarely trees, stellately pubescent, the stellate mixed with simple hairs. Leaves usually serrate. Flowers usually small, clustered or panicled. Calyx 5-fid or 5-toothed, campanulate or inflated. Petals 5, spathulate or oblong, marcescent. Stamens 5, opposite the petals, connate at the base or beyond the middle; staminodes O, or (rarely) minute and dentiform; anther-cells parallel. Ovary sessile or shortly stalked, 5-celled; ovules 2 in each cell; styles 5, free or united at the base, stigmatose and usually thickened above. Capsule loculicidally 5-valved. Seeds ascending, more or less albuminous; embryo straight; cotyledons flat; radicle next the hilum. —Species 65.—Tropics.

M. borbonica Cav. is used medicinally in La Reunion.

1. **Melochia corchorifolia** Linn. Sp. Pl. (1753) 675.—*Riedleia corchorifolia* DC. Prodr. I, 49.

An erect branched herb; stems and branches nearly glabrous. Leaves very variable in size and shape, 2.5-7.5 by 1.2-3.8 cm., ovate-oblong, acute, serrate, sometimes obscurely lobed, glabrous on both surfaces or with a few sacttered stellate hairs, base acute, rounded or truncate; petioles 1-2.5 cm. long, slender; stipules lanceolate, 3 mm. long, ciliate. Flowers small, pink, subsessile, densely crowded in terminal clusters; involucral bracts lanceolate-subulate, hairy. Sepals

lanceolate, ciliate, 6 mm. long. Petals 6 mm. long, thin, oblong-cuneate, truncate. Capsules depressed-globose; valves sparingly hairy. Seeds angular, mottled black and grey.

Distribution: Hotter parts from Kumaon to Sikkim and Malacca Peninsula, Cutch, Gujarat, Konkan, N. Kanara, most districts of the Madras Presidency, Ceylon.—Tropics generally.

The whole of this plant, with the exception of the root, boiled in oil, is supposed on the Malabar Coast to be an efficacious remedy for preventing bad consequences from the bite of a water snake (Ainslie).

Water snakes are harmless (Caius).

Bengal: Tikiokra—; *Malay:* Luma, Ketam—; *Malayalam:* Seruvuram—; *Mundari:* Delaara, Delkaara—; *Philippines:* Calingan—; *Santal:* Thuiakarak—; *Sinhalese:* Galkura—; *Sokoto:* Tukurra—; *Tamil:* Pinnakkuppundu, Punnakkukkirai—; *Telugu:* Ganugapindikura, Sittantakura, Tutturubenda—; *Uriya:* Chyeron, Dasokerotan, Nolita—.

ABROMA Jacq.

Trees or shrubs. Leaves cordate, ovate-oblong, serrulate, sometimes angled. Peduncles opposite the leaves, few-flowered. Sepals 5, connate near base. Petals 5, purplish, concave below, prolonged above into a large spoon-shaped lamina. Staminal cup of 5 fertile and as many sterile divisions, fertile filaments opposite the petals, 3-antheriferous; anthers 2-lobed, lobes divergent. Staminodes longer than the fertile filaments, obtuse. Ovary sessile, pyramidal, 5-lobed; cells many-ovuled; styles 5. Capsule membranous, 5-angled, 5-winged, truncate at apex, septicidally 5-valved, valves villous at the edges. Seeds many, albuminous; embryo straight, cotyledons flat, cordate; radicle next the hilum.—Species 10.—Tropical Asia to Australia.

A. augusta Linn. is used medicinally in Indo China and in the Philippine Islands. In the latter country *A. alata* Blanco is also credited with therapeutic properties.

1. **Abroma augusta** Linn. f. Suppl. (1781) 341 (*Ambroma*). —*A. fastuosa* Gaertn. Fruct. I, 307, t. 64 (non R. Br.).—PLATE 153.

A shrub or small tree with velvety branches. Leaves 10-15 by 10-12 cm., repand-denticulate, base 3-7-nerved, upper smaller, narrower, entire, glabrescent above, tomentose below; petiole 12-25 mm. Stipules linear, deciduous, as long as the petiole. Peduncle about 4 cm. long, axillary. Flowers 5 cm. diam., dark red. Sepals 2.5 cm., lanceolate, free nearly to the base. Petals scarcely exceeding the sepals, imbricate in bud, deciduous. Capsule almost 4 cm. long, obpyramidal, finally glabrous, thrice as long as the persistent calyx. Seeds enveloped in light cottony wool.

Distribution: Indigenous or cultivated throughout the hotter parts of India, Java, Philippines, China.

The root bark has long been used in Bengal as an emmenagogue.

In Lakhimpur (Assam) the bark is used for sores. A paste of the root is used internally and externally to cure abscess (Carter).

"Forty years ago I first came to know the medicinal properties of this indigenous plant as a good emmenagogue in menstrual disorders . . . . The officinal part of the plant is the fresh viscid sap, which abounds in the thick easily separable bark of the root and is insoluble in water . . . . Attempts have been made to administer the drug in the more acceptable forms of tincture, pill or powder, but none prove so efficacious as the fresh viscid sap in substance, in which form I have used it with wonderful results" (Sircar; Ind. Med. Gaz., May, 1900).

The fresh viscid juice of the root-bark is useful in the congestive and neuralgic varieties of dysmenorrhœa; it regulates the menstrual flow and acts as an uterine tonic (Thornton; Am. Journ. Med. Sc., P. 276, 1873).

The root-bark is an emmenagogue and uterine tonic. The action of the dried root as well as the sap of the fresh root, has been studied in my laboratory. It showed a tonic contractile action on the uterus and its use is, therefore, indicated before the menses, to help the uterine contractions to bring about a proper flow of menstrual blood. The active principle of the drug is totally destroyed if mixed with

alcohol or any other preservative; either the fresh root-bark or dried root-bark should be used (K. C. Bose).

The alkaloid and different fractions obtained during the course of analysis including the water-soluble bases were passed through pharmacological tests, but no remarkable activity was manifested on the gastro-intestinal tract, circulation, respiration, etc., nor was there any marked effect on the uterus whether virgin or pregnant, isolated or *in situ*. In the absence of any signs of physiological activity, clinical trials were not carried out. (Chopra, Ghose, and Chatterjee).

The root bark has the following constituents: mixed oil; resins; alkaloid, in minute quantities; water-soluble bases (Chopra, Ghose, and Chatterjee).

Assam: Gunakhiakarai—; *Bengal:* Olatkambol, Ulatkambal, Ulutkambal—; *Bombay:* Olatkambol—; *Canarese:* Melpundigida—; *Ceylon:* Ulatkambal—; *English:* Devil's Cotton—; *French:* Abrome—; *German:* Abrome—; *Hindi:* Kumal, Ulatkambal, Sanukapashi—; *Indo China:* Bom vang, Tai meo—; *Lepcha:* Chuil—; *Nepal:* Sanukapasi—; *Philippines:* Anabo—; *Tagalog:* Anibog, Anibong—; *Tamil:* Sivapputtutti—; *Uriya:* Pisachogonjai—.

GUAZUMA Plum. ex Adans.

A tree. Leaves simple, tomentose. Flowers in axillary cymes. Sepals 5, connate below. Petals 5, concave at the base, prolonged above into 2 narrow strap-shaped processes. Stamens 10, connate below into a tube, divided above into 5 3-anthered, filaments alternating with 5 lanceolate staminodes. Ovary sessile, 5-lobed, 5-celled; styles more or less connate; ovules many in each cell. Fruit globular, woody, tubercled, many-seeded. Seeds albuminous; cotyledons folded.—Species 5.—Tropical America.

The fruit is emollient and astringent.

G. ulmifolia Lam. is used medicinally in Brazil and in La Reunion.

1. **Guazuma tomentosa** H. B. & K. Nov. Gen. Pl. V (1821) 320.—PLATE 154.

Leaves 7-11 by 5 cm., oblong-ovate, obliquely cordate, acuminate, serrate, scabrid above, pubescent beneath, base 5-7-nerved. Flowers small, in axillary cymes, yellow. Sepals 5, at first spathaceous. Petals 5. Anthers 2-lobed; lobes divergent. Capsule 12-25 mm. long, globose or oblong, 5-celled, woody, covered with blunt tubercles, black when ripe.

Distribution: Frequently cultivated.—A native of tropical America.

The bark is tonic and demulcent, and is used with benefit in some of those cases in which calumba and gentian are indicated (Moodeen Sheriff).

The inner bark is esteemed as a remedy for elephantiasis in the West Indies; the infusion of the old bark is esteemed as a sudorific, and as useful in cutaneous diseases and diseases of the chest.

Bengali: Nipaltunth—; *Deccan:* Bandog—; *Canarese:* Bucha, Rudrakshi—; *English:* Bastard Cedar, Honey Fruit Tree, Musket Tree—; *Madras* Tenmaram—; *Malayalam:* Rudraksham—; *Tamil:* Rudrasam, Tenbachai, Tengai, Tubakki, Uruttiracham—; *Telugu:* Rudraksha, Udrikpatta—; *Tulu:* Rudrakshi—; *Uriya:* Debodaru—.

THEOBROMA Linn.

Usually small trees. Leaves large, entire, simple, thick and strongly nerved. Flowers small, sometimes borne laterally on the branches rather than in axils. Calyx deeply 5- parted or- lobed. Petals 5, mostly clawed or narrowed below. Fertile stamens 5, opposite the sepals. Ovary sessile, 5-celled, many-ovuled; style filiform. Fruit a large woody drupe or pod. Seeds imbedded in pulp.—Species about 20.—Tropical America. One species sometimes grown in the Bombay Presidency.

The seeds are analeptic. They yield a fixed oil known as " oil of Theobroma " or " Cacao Butter "; and they are extensively used for the extraction of the alkaloid " theobromine."

The species used are all originally South American: *T. bicolor* H. & B., *T. cacao* Linn., *T. glauca* Krst., *T. martiana* D. Dietr., *T. macrantha* Bernoulli, *T. microcarpum* Mart., *T. sylvestris* Aubl.—.

OFFICIAL:—The seeds of *Theobroma Cacao* Linn.=*Cacao sativa* Lamk.—(Portugal); *Theobroma spp.* (Spain).

The fat from the seeds of *T. Cacao* Linn. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Spain, Sweden, Switzerland, Turkey, United States).

1. **Theobroma cacao** Linn. Sp. Pl. (1753) 782.

A wide-branching evergreen tree, reaching 5-8 m. in height. Twigs pubescent. Leaves alternate, oblong-oval or elliptic-oblong, entire, short-petioled, the blade 15 cm. long more or less, rounded at the base, abruptly acuminate, with strong midrib and paired or somewhat alternate arching side veins. Flowers small, in fascicles directly on the bark of the trunk and main branches, about 2 cm. across when expanded. Pedicels slender, 12 mm. or more long. Calyx rose-coloured; segments acuminate. Corolla yellowish; petals with a stalk-like claw and expanded blade. Fruit 30 cm. long or shorter, mostly 10 cm. or less in diam., about 10-ribbed, red, yellow, purplish or brown, elliptic-ovoid, the rind thick, hard and leathery; cells 5, each with 5-12 seeds in a row imbedded in a white or pinkish acid pulp.

Distribution: Apparently a native of Central and S. Africa.

The seeds contain from 1.5 to 2.4 per cent theobromine.

Its starch, sugar, and fat contents mark cacao as a nutritive seed; its alkaloid, theobromine, marks it as a urinary stimulant.

Ceylon: Chocolathgas, Cocomaram—; *Dutch:* Cacaoboom, Kakauboom—; *English:* Cacao, Chocolate Tree, Cocoa—; *French:* Cabasse, Cabosse, Cacao, Cacaotier, Cacaoyer—; *German:* Kakaobaum—; *Hungarian:* Kakao, Kokuszfa—; *Italian:* Albero del Cacao, Cacao—; *Mexican:* Cacacoatl—; *Portuguese:* Cacao—; *Roumanian:* Cacaotier—; *Russian:* Kakaovoi derevo—; *Spanish:* Arbol del cacao, Cacao, Haba de Mejico—; *Swedish:* Kakao—; *Turkish:* Kakao—.

BUETTNERIA Loefl.

Herbs, shrubs or trees, often climbing and frequently prickly. Leaves often glabrous. Flowers minute, in much-branched axillary or terminal umbellate cymes. Sepals 5, connate below. Petals 5,

claws concave, limb with a long strap-shaped 2-fid appendage. Stamens 10, connate below, bearing 5 stamens alternating with 5 staminodes. Ovary sessile with 5 2-ovuled, cells; style entire or 5-fid. Capsule globose, spiny, with 5 1-seeded, cells and 5 septicidally deciduous valves. Seeds axile, exalbuminous; cotyledons folded round the superior radicle; plumule lobed.—Species 60.—Tropics.

The genus is therapeutically inert.

1. **Buettneria herbacea** Roxb. Corom, Pl. I, t. 29; Wight Ic. t. 488.

A branched herb with a perennial woody rootstock. Leaves distant, ovate-lanceolate, acuminate, toothed, paler beneath, 2.5-6 cm. long, base cordate or rounded, 3-5-nerved; petiole 4 mm. long. Stipules linear, equalling the petiole. Flowers small, purplish, in axillary cymes. Sepals linear-lanceolate, reflexed. Petals with long slender tips and 2-fid appendages. Fertile filaments very short, staminodes ovate. Capsule softly spiny, 6 mm. diam.

Distribution: Orissa; Madras Presidency: N. Circars, Deccan and Carnatic, Bombay Konkan.

The rootstock is ground and rubbed on swellings of the legs by the Kols. It is also used in combination with Bael fruit, hesel gum, and Banyan root in cholera and diarrhœa. It is given in the female complaint known in Santali as "pordhol" (Campbell).

Kolani: Idelsanga—; *Porebunder:* Adbaubal, Vagdaubal—; *Santali:* Dekusindur—.

TILIACEAE.

Trees, shrubs or herbs, usually with mucilaginous juice. Leaves usually alternate, simple or lobed, usually stipulate. Flowers regular, hermaphrodite or rarely 1-sexual, usually in cymes. Sepals 3-5, free or connate, usually valvate. Petals 3-5 or 0, inserted round the base of the torus, contorted imbricate or valvate. Stamens usually indefinite, inserted on a torus; filaments free or sometimes

5-10-adelphous, but not united into a tube. Ovary free, 2-10-celled; ovules 1-many; style entire, divided or 0. Fruit 2-10-celled, or by false septa many-celled, often drupaceous.—Genera 35. Species 380.—Tropical and temperate, chiefly S.-E. Asia and Brazil.

A. Anthers opening by slits
- I. Petals usually foveolate or glandular at the base; stamens springing from the apex of a raised torus
  - a. Fruit without prickles .... GREWIA.
  - b. Fruit prickly
    Herbs or undershrubs. Fruit small .... TRIUMFETTA.
- II. Petals not foveolate or glandular at the base; stamens springing from a contracted torus .... CORCHORUS.

B. Anthers opening by a terminal pore
Petals sepaloid .... ELAEOCARPUS.

In general the leaves are mucilaginous and emollient; the bracts and flowers are aromatic, antispasmodic, and slightly sudorific. The bark may be bitter and astringent.

Among the products obtained may be mentioned:—(1) a volatile oil; (2) laevo-rotatory phytosterols; (3) vanillin; and (4) glucosides—capsularin, corchorin, tiliacin—.

OFFICIAL:—*Tilia spp.* (Italy, Spain); *T. cordata* Mill. (Germany, Holland, Italy, Turkey); *T. europaea* Desfont.=*T. platyphylla* Scop. (Portugal); *T. europaea* var. γ Linn.=*T. microphylla* Vent. (Portugal); *T. intermedia* DC.=*T. vulgaris* Hayn. (Spain); *T. platyphylla* Scop. (France, Spain); *T. platyphyllos* Scop. (Austria, Belgium, Germany, Holland, Italy, Switzerland, Turkey) =*T. grandifolia* Ehr. (Hungary, Russia); *T. sylvestris* Desf. (France); *T. ulmifolia* Scop. (Austria)=*T. parvifolia* Ehr. (Hungary, Russia); *T. vulgaris* Hayn. (Belgium).

GREWIA Linn.

Trees or erect straggling or climbing shrubs, usually stellately pubescent. Leaves alternate, 3-7-nerved. Flowers usually yellow, in axillary, extra-axillary or terminal cymes, fascicles or panicles. Sepals 5, distinct. Petals 5, usually with a gland at the base within, generally shorter than the sepals, very rarely 0. Stamens numerous, inserted on a short or elongated often glandular torus. Ovary 2-4-

celled; ovules 2-several in each cell; style 1; stigma 2-5-lobed or laciniate. Fruit of 1-4 pyrenes, entire or 2-4-lobed. Pyrenes usually 1- or 2- seeded.—Species 150.—Asia, Africa, Australia, especially tropical.

A. Inflorescence terminal and axillary (sometimes extra-axillary). Flowers in umbellate cymes
Scandent shrubs. Torus long. Drupes obscurely lobed, purple .... 7. *G. umbellata.*

B. Inflorescence leaf-opposed and axillary.
Leaves glabrous or nearly so .... 6. *G. tenax.*

C. Inflorescence axillary (rarely extra-axillary).
I. Leaves usually hoary, at least beneath
Leaves 5-6-nerved
1. Stipules leafy, auricled .... 1. *G. tiliaefolia.*
2. Stipules linear-lanceolate .... 2. *G. asiatica.*
II. Leaves not hoary beneath, orbicular.
Anthers glabrous.
a. Drupes with a crustaceous rind.
1. Leaves 2.5-7.5 cm. .... 4. *G. villosa.*
2. Leaves 7.5-15 cm. .... 3. *G. sclerophylla.*
b. Drupes fleshy. Flowers polygamous. Branched shrub. Stamens more than 40 .... 5. *G. hirsuta.*

D. Inflorescence terminal, in panicled cymes.
Flowers involucrate
I. Petals oblong, entire or shortly emarginate. Thrice shorter than sepals .... 9. *G. microcos.*
II. Petals entire, much shorter than sepals .... 8. *G. paniculata.*

Mucilaginous and demulcent, useful in the treatment of diarrhœa and dysentery.

The following are used medicinally in Indo China—*G. paniculata* Roxb.—; in the Philippine Islands—*G. paniculata* Roxb., *G. umbellata* Roxb.—; in Australia—*G. hirsuta* Vahl—; in the Gold Coast—*G. mollis* A. Juss.—; in Southern Africa—*G. occidentalis* Linn.

1. **Grewia tiliaefolia** Vahl Symb. I (1790) 35.—*G. asiatica* var. *tiliaefolia* Brandis Ind. Trees (1911) 98.—Plate 155.

A tree, 9-10.5 m. high; bark pale brown; young parts densely pubescent. Leaves 7.5-12.5 by 5-7.5 cm., ovate, acuminate with a tendency to become lobate at the apex, crenate-dentate, upper surface minutely stellately hairy or subglabrous, the nerves pubescent, lower

surfaće hoary-tomentose, cordate and inequilateral at the base, 6-nerved, 3 nerves at the larger and 2 at the smaller side of the midrib; petioles 6-18 mm. long, pubescent; stipules 10 mm. long, leafy, somewhat falcate, auricled, with a rounded lobe on the lower side, veined. Flowers small, umbellate; buds obovoid-oblong or subglobose, tomentose; peduncles 3 or several, axillary, thick, about equalling the petioles; pedicels 3-5, divergent, shorter than the peduncles; bracts beneath the pedicels linear-lanceolate. Sepals 8 mm. long, oblong, subacute, pubescent outside, glabrous within. Petals about half as long as the sepals, oblong or spathulate, entire or notched; gland about one-third the length of the petal, densely white-villous on the margin. Torus rather long, ribbed, glabrous, with 5 obscure villous teeth at the apex. Ovary villous; style longer than the stamens; stigma somewhat irregularly 5-lobed. Drupes size of a pea, black, globose or 2- (rarely 4-) lobed; stones 1-2-celled.

Distribution: Sub-Himalayan region from the Jumna to Nepal up to 4,000 ft., Central India, all districts of Madras Presidency, Bihar, Orissa, Burma, Ceylon.—E. tropical Africa.

The bark is acrid with a sharp sweetish taste; digestible, strengthening, aphrodisiac; heats the body; heals wounds; cures "kapha," "vata," burning sensation, thirst, throat complaints, biliousness, cough, diseases of the nose, and of the blood. The fruit is sweet and cooling, slightly acrid; removes "kapha" and "vata" (Ayurveda).

In the Konkan the bark, after removal of the tuber, is rubbed down with water, and the thick mucilage strained from it and given in 5-tola doses, with 2 tolas of the flour of *Panicum miliaceum* (warri) as a remedy for dysentery.

The bark is also employed externally to remove the irritation from cow-itch.

The wood reduced to a powder acts as an emetic, and is employed as an antidote to opium poisoning.

Bengal: Dhamani, Pharsa—; *Bhil:* Dhamnak—; *Bombay:* Damana, Karakana—; *Canarese:* Batale, Butale, Buttele, Dadsal, Jana, Tadagana, Tadasali—; *Central Provinces:* Damun, Dhamni—; *Gond:* Kasul, Khesla—; *Gujarat:* Dalmon, Dhamana—; *Hindi:* Dhamani, Dhamin, Pharsa—; *Kadir:* Chatachi, Una—; *Khond:*

Kahal, Karkana—; *Kolami:* Dhamin—; *Konkani:* Butale, Dadsale, Damoni—; *Kurku:* Dhamni—; *Malayalam:* Satachi, Una—; *Marathi:* Daman, Damni, Dhaman, Karavarani, Karkarani—; *Mundari:* Asin, Asindaru, Bengadaru—; *Porebunder:* Dhaman, Dhraman—; *Sanskrit:* Dhamni, Dhanuvriksha, Dharwana, Dharmana, Mahabala, Pichhilaka, Pichhilatvaka, Raktakusuma, Rujasaha, Ruksha, Swaduphala—; *Saora:* Inuputada—; *Santal:* Olat—; *Sinhalese:* Daminne—; *Tamil:* Sadachi, Tada, Tarra, Una, Unnu—; *Telugu:* Charachi, Ettatada, Jana, Nulijana, Tada, Tadajana, Udupai—; *Tulu:* Kanapadi—; *Uriya:* Dhaman, Dhamono—.

2. **Grewia asiatica** Linn. Mant. (1767) 122 (non Roxb.); Parker Fl. Punj. (1918) 55; Mast. in Hook. f. Fl. Brit. Ind. I, 386 (excl. syn. *subinaequalis*).—PLATE 156.

A shrub or small tree; young parts stellately pubescent. Leaves 7-17 by 6-12 cm., ovate or suborbicular, acute or subacuminate or cuspidate, sharply and often coarsely doubly serrate, subglabrous above, hoary-tomentose beneath, rounded or only slightly cordate at the base 5-6-7-nerved; petioles 6-12 mm. long, thickened at the top; stipules nearly as long as the petioles, linear, subulate or lanceolate. Flower-buds broadly cylindric or clavate. Peduncles axillary, usually many, long and slender, far exceeding the petioles and often 3-4 times as long, sometimes 4 cm. long. Flowers large. Bracts beneath the pedicels lanceolate. Sepals about 10 mm. long, linear-oblong, acute, stellately pubescent or tomentose. Petals yellow, oblong or ovate-oblong, jagged or entire, about 6 mm. long, not bifid, gland with a wide fleshy margin, pubescent towards the edges. Gonophore long. Stigma with 4 short, rounded lobes; style much thickened above. Fruit red, globose, 6-8 mm. diam.; pyrenes 1-2, always 1-celled only.

Distribution: Extensively cultivated; in the wild state unknown.

The unripe fruit is bitter, acrid, sour; removes "vata"; causes "kapha"; and biliousness.—The ripe fruit is sweet, pleasant to the taste, and cooling; digestible, tonic, aphrodisiac; allays thirst and burning sensation; removes "vata" and biliousness; cures inflammations, heart and blood disorders, fevers, and consumption. The fruit is good for troubles of the throat; helps removal of dead foetus.—

The bark cures biliousness and "vata"; removes urinary troubles, and burning in the vagina (Ayurveda).

The fruit is sour and sweet; strengthens the chest and the heart; relieves thirst and hiccough; useful in diarrhoea and fevers; should not be eaten raw.—The root and bark are used in strangury, gleet, and gonorrhoea (Yunani).

An infusion of the bark is used as a demulcent.

The fruit is supposed to possess astringent, cooling and stomachic properties.

The leaves are used as an application to pustular eruptions, and the buds are also prescribed by native practitioners.

The Santals use the root-bark for rheumatism (Campbell).

Ajmere: Dhamni—; *Arabic:* Phalasah—; *Bengal:* Phalsa, Shukri—; *Burma:* Pintayaw, Tagaw—; *Bombay:* Phalasi—; *Canarese:* Buttiyudippe, Jana, Tadasala—; *Central Provinces:* Dhamru, Dhamun—; *Deccan:* Phulsha, Pulsha—; *Gujarat:* Phalsa—; *Hindi:* Dhamin, Karra, Parusha, Phalsa, Pharvah, Pharsa, Phulsa, Shukri—; *Kohlu:* Pistawan—; *Kolami:* Gonyia, Singhindamin—; *Konkani:* Phalsi—; *Kotra:* Pharwan—; *Malayalam:* Chadicha—; *Marathi:* Phalsi—; *Nepal:* Sialposra—; *Newari:* Fussi—; *North-Western Provinces:* Dhaman, Phalsa, Pharsiya—; *Parbut:* Fulsa, Fursu—; *Persian:* Falseh, Palasah—; *Punjab:* Phalsa—; *Pushtu:* Pastaoni, Shikarimaiwah—; *Sanskrit:* Alpasthi, Dhanvanchhada, Giripilu, Mriduphala, Nagadalapam, Nilacharma, Nilamandala, Parapara, Paravata, Parusha, Parushaka, Porusha, Purusha, Roshana—; *Santal:* Jangolat—; *Sind:* Phalsa, Pharaho—; *Sinhalese:* Dowaniya—; *Tamil:* Palisa, Tadachi, Unnu—; *Telugu:* Jana, Nallajana, Peddajana, Phutiki, Putiki—; *Urdu:* Phalasah—; *Uriya:* Pharosakoli—.

3. **Grewia sclerophylla** Roxb. Hort. Beng. (1814) 42.—*G. scabrophylla* Roxb. Fl. Ind. II, 584.—PLATE 157 (under *G. scabrophylla* Roxb.).

A shrub with woody rootstock, sending up annual woody stems from the base which attain 0.6-1.5 m. high. Leaves 10-18 by 7.5-15 cm., broadly elliptic or suborbicular, sometimes slightly lobed,

irregularly serrate or denticulate, the larger teeth glandular-tipped, base usually oblique, cuneate rounded or slightly cordate, 3-5-nerved but only 3 strong nerves, scabrid above, densely stellate-pubescent and usually whitish or pale grey beneath. Petiole 5-15 mm. long, very stout, tomentose, usually with several pairs of large glands near the top and on the margin of the blade. Flowers white, about 2.5 cm. diam., 2-3 together on each peduncle. Peduncles axillary, solitary or clustered, up to 12 mm. long, stout, tomentose. Pedicels up to 12 mm. long, stout, tomentose. Fruit 1.7-2.5 cm. diam., globose, not lobed, purple, crustaceous, hairy.

Distribution: Throughout the sub-Himalayan tract and outer hills of Kumaon, up to 3,500 ft., Sikkim, Assam, Chittagong, Ava.

The root is prescribed in coughs and irritable conditions of the intestines and bladder. The decoction is also used as an emollient enema.

Burma: Petshat—; *Canarese:* Darsuk, Kadukadele—; *Cutch:* Lusaka—; *Dehra Dun:* Gurbheli—; *Gujerati:* Padekhado—; *Kumaon:* Pharsia—; *Lepcha:* Taglar—; *Marathi:* Khatkhati, Pandharidhaman—; *Mundari:* Gaphni—; *Tamil:* Kattukkadali—; Punaippidukkan—; *Telugu:* Bankajana—.

4. **Grewia villosa** Willd. in Ges. Naturf. Fr. Neue Schr. IV (1803) 205.—*G. orbiculata* G. Don Gen. Syst. I, 551 (non Rottl.). PLATES 151A & 158B.

A shrub reaching 1.8 m. high; branches grey-puberulous. Leaves 3.7-7.5 cm., rotund-ovate, subcordate, shortly acuminate or rounded, crenate-serrate, the serratures usually with a tuft of hairs at the apex, 5-nerved, rugose-reticulate with numerous transverse veins, rough with stellate hairs above, velvety beneath; petioles 1.2-2.5 cm. long, densely villous; stipules foliaceous, ovate-oblong, acute, hairy, caducous. Flowers in axillary or leaf-opposed cymes; buds ellipsoid, pilose; peduncles very short; pedicels 2-4; bracts oblong. Sepals 6-10 mm. long, lanceolate, pilose. Petals dull yellow, oblong-obovate, slightly emarginate, about half the length of the sepals; gland orbicular-oblong, ciliate, a little less than half the length of the petal. Anthers glabrous. Torus very short, almost O. Ovary densely pilose; style hairy;

stigma lacerate. Drupes globose, about 12 mm. diam., yellowish red; rind crustaceous, stellately hairy; stones 4, 1-2-seeded, smooth, in a sweet edible pulp.

Distribution: Trans-Indus, Punjab, Rajputana, Sind, Cutch, Kathiawar, Deccan and Carnatic of the Madras Presidency from the Kistna southwards.—Cape Verde Islands, tropical Africa.

The juice of fresh bark is used with sugar and water for gonorrhoea and urinary complaints attended with irritability of the bladder.

The root is employed for diarrhoea in Chota Nagpur (Campbell).

Ajmere: Dhohan—; *Canarese:* Buttigaragale, Garakele, Sannudippe—; *Cutch:* Luskana—; *Gujerati:* Padekhado, Parekhado—; *Kamba:* Mugu—; *Kolami:* Gaphni—; *Marathi:* Kharmati—; *Merwara:* Dhokelan—; *Punjab:* Jalidar, Kaskusri, Thamther—; *Pushtu:* Inzarra, Pastuwanne—; *Santal:* Tarsekolap—; *Tamil:* Kullai—; *Telugu:* Banta, Chenula—; *Tigré:* Hafule, Khofule—.

5. **Grewia hirsuta** Vahl Symb. I (1790) 34, var. *helicterifolia* (Wall. sp.).—*G. polygama* Mast. in Hook. f. Fl. Brit. Ind. I, 391.—PLATE 158A (under *G. polygama*).

A shrub 30-90 cm. high, branches slender. Leaves 5-11 by 0.7-2.5 cm., oblong or linear-lanceolate, narrowed gradually to the apex, serrate, the teeth blunt, small, often irregular in size, base rounded, 3-nerved, clothed with very small stellate hairs above, densely stellate-pubescent beneath; petiole 2.5-3.8 mm. long, stout, hairy; stipules 2.5 mm. long, linear-subulate, hairy. Flowers white turning yellow, male and bisexual, 2-4 together; peduncles axillary, solitary or sometimes paired, 5-25 mm. long, slender; pedicels 3.8-10 mm. long; buds ovoid, densely hairy. Sepals 5 mm. long, oblong, tomentose outside. Petals 3 mm. long, oblong, claw distinct. Fruit 7.5-10 mm. diam., more or less 2-4-lobed, shining, brown, with scattered hairs and a ring of hairs at the top of the androgynophore.

Distribution: Sub-Himalayan tract up to 4,500 ft. from the Indus eastwards, Salt Range, Bihar, Orissa, Burma, Ceylon.—N. Australia.

The leaves are of two kinds: bitter, and tasteless.—1. The bitter leaves lessen inflammations; useful in nose and eye diseases; anthelmintic. The root of this variety is astringent to the bowels;

useful in cholera, hydrophobia, kidney pain, piles; anthelmintic.—2. The leaves and fruit of the second variety—with tasteless leaves—are purgative, expectorant, carminative, abortifacient, emmenagogue, vulnerary, galactagogue; useful in splenic enlargement, eye troubles, piles, rheumatism, pain in the joints and in the breasts (Yunani).

The fruit is employed as a medicine by the Santals, in diarrhoea and dysentery. The root pounded is also prescribed for the same diseases, and powdered in water is applied externally to hasten suppuration, and as a dressing for wounds. The paste dries and forms a hard coating, thus effectually excluding air from the raw surface (Campbell).

This plant is used by the aborigines of North-Western Australia as a remedy for dysentery.

Arabic: Kamafetusa—; *Bombay:* Gowali, Gowli—; *Burma:* Kyettayaw—; *Hindi:* Kakarundah, Kukurbicha—; *Marathi:* Govli—; *Persian:* Karafasrumi—; *Porebunder:* Khaddhramani—; *Santal:* Setaandir, Setakata—; *Telugu:* Jibilike, Chimachipuru—; *Urdu:* Kakarundehrumi—.

6. **Grewia tenax** Fiori Bos. Piante legn. Eritrea (1909) 246; Blatter Fl. Arab. in Rec. Bot. Surv. Ind. VIII, pt. 1 (1919) 88.—*Chadara tenax* Forsk Fl. Aeg.—Arab. (1775) p. CXIV and p. 105.—*Grewia populifolia* Vahl Symb. I (1790) 33.—*G. betulaefolia* Juss. in Ann. Mus. Par. IV (1804) 92, t. 4, f. 1.

A shrub, 0.6-1.8 m. high; stems and branches terete, slender. Leaves up to 3.8 by 3.2 cm., broadly ovate or suborbicular, sometimes obovate, acute or obtuse, coarsely dentate, glabrous or nearly so, base rounded or cuneate; petioles 6-12 mm. long, very slender, stipules small, linear, caducous. Flowers pure white, 1.9-2.5 cm. across; buds oblong, tomentose; peduncles usually solitary, leaf-opposed, thickened near the top, bearing 1 (rarely 2 or 3) flowers; bracts 2, near the middle of the pedicel, caducous, leaving a mark which has the appearance of a joint. Sepals 1.2-2 cm. long, linear-oblong, tomentose outside. Petals linear-oblong, usually notched, about two-thirds the length of the sepals, attached along the back of the gland; gland broad, suborbicular or obscurely 3-lobed, the margin villous. Torus about

2 mm. long, the lower portion glabrous, faintly ribbed, with 5 densely villous teeth at the top beneath the ovary. Ovary 4-lobed, glabrous (rarely pilose); style longer than the stamens; stigma 4-5-lobed. Drupes smooth, orange-yellow, about 12 mm. broad, usually of two separable halves, each half didymous; stones 1-4, muriculate, 1-2-celled.

Distribution: Punjab, Desert of W. Rajputana, Sind, Baluchistan, Cutch, S. M. Country, Deccan and Carnatic of Madras Presidency, Ceylon.—Afghanistan, Persia, Arabia, tropical Africa, Mauritius.

In Jhalawan a decoction of the wood is given to cure coughs and pains in the side (Hughes-Buller).

Baluchistan: Gwangi, Kango—; *Rajputana:* Gangerun, Gango—; *Telugu:* Gundukadira, Kadadari, Kaladi, Kattekolupu—.

7. **Grewia umbellata** Roxb. Hort. Beng. 42.

A climbing shrub 15 mm. or more long all stellate-puberulous. Leaves oblong-ovate or elliptic, serrate, bluntly acuminate, base rounded, above glabrous, beneath pale; nerves 4 pairs, 7.5-11.5 cm. long, 3.8-5 cm. wide; petioles 6 mm. long. Umbels panicled, axillary or terminal 6- to 8- flowered. Flowers 2 cm. long, yellowish white. Sepals ribbed, tomentose, linear-oblong, reflexed in flower. Petals as long or shorter, oblong from the back of an orbicular hairy concave claw. Stamens connate at base in a silky tube. Torus long, tomentose. Fruit globular, green; pyrene 2- to 4- celled; cells 1-seeded; endocarp bony.

Distribution: Malay Peninsula.—Siam, Borneo.

The leaves are used to cure cuts and wounds.

Malay: Akar chenderai, Akar Kapialu, Akar sekapu, Akar sempelas lida Kuching—; *Philippines:* Danloy.—

8. **Grewia paniculata** Roxb. Fl. Ind. II, 591.

A bushy tree 6-12 m. tall, 0.6 m. through. Branchlets tomentose. Leaves coriaceous cuneate-obovate to elliptic, blunt acuminate, edges serrate dentate, base rounded; nerves from base 5 or 6 pairs, above sparsely pubescent, midrid and nerves tomentose, beneath stellate-tomentose; nervules horizontal, elevate beneath, 7.5-15 cm. long, 3.8-7 cm. wide; petioles 6 mm. long, tomentose.

Stipules glabrous lanceolate. Panicles 5.7-9 cm. long, terminal or axillary, tomentose; bracteoles linear. Flowers 6 mm. long. Sepals obovate, base rounded, tomentose outside, pilose inside. Petals shorter, yellowish white, oblong blunt, claw concave, hirsute outside. Torus cup-shaped, edge tomentose. Ovary ovoid, stellate-tomentose, 4-celled. Fruit obovoid, green hard, minutely pubescent; pyrene 1-celled, 1-seeded; endocarp stony.

Distribution: Malay Peninsula.—Indo China.

In the Southern parts of Indo China a decoction of the roots is given as a cure for cough.

Indo China: Co ke, Poplear thom—; *Malay:* Chenderai hutan—; *Visayan:* Bangalad—.

9. **Grewia microcos** Linn. Syst. ed. 12, II (1767) 602.—Wight Ill. I, t. 33.—*Grewia ulmifolia* Roxb.; Wight Ic. t. 84.

A shrub; young parts stellately pubescent. Leaves 10-15 by 3.8-5.7 cm., elliptic-oblong, acuminate, glabrous, entire or slightly and irregularly toothed, base oblique, rounded or acute, 3-nerved, the nerves and veins prominent beneath; petioles 6-10 mm. long; stipules 6-13 mm. long, linear, acute. Flowers in terminal panicles; buds subglobose or ovoid, grey-tomentose, 2 or 3 close together enclosed within an involucre of 6-8 oblong-lanceolate imbricate bracts; pedicles short; bracts of the pedicels subulate. Sepals 6 mm. long, obovate-oblong, tomentose on both surfaces. Petals less than one-third the length of the sepals, ovate, acute, pubescent at the base outside; gland half as long as the petal, slightly ciliate. Torus short, lobed at the apex. Ovary glabrous; style much longer than the stamens, glabrous; stigma minute, bifid. Fruit globose or slightly obovoid, about 10 mm. across, purplish, glabrous, wrinkled; mesocarp fibrous; stone 1-celled.

Distribution: E. Bengal, Assam, Burma, W. Peninsula, Mysore, Ceylon.—China, Java.

The plant is much used medicinally; it is given for indigestion, eczema and itch, small pox, typhoid fever, dysentery, syphilitic ulceration of the mouth.

Bengal: Asar—; *Bombay:* Ansale, Shiral—; *Burma:* Myatya, Myaza—; *Canarese:* Abhhrangu, Biliyabhhrangu, Majjigesoppu—;

Malayalam: Kottakka—; *Sinhalese:* Keliya, Kohukirilla—; *Tamil:* Kadambu, Visalam—; *Tulu:* Abroni—.

TRIUMFETTA Linn.

Herbs or undershrubs with stellate pubescence. Leaves serrate, entire or 3-5-lobed. Flowers yellow, axillary or leaf-opposed, few or densely fasciculately cymose. Sepals 5, distinct, frequently mucronate at the apex. Petals 5 (rarely 0), glandular, thickened or foveolate at the base, inserted round the base of the torus. Stamens indefinite or rarely twice as many as the sepals, inserted on a glandular torus, free. Ovary 5-celled; ovules 2 in each cell; style filiform; stigma 2-5-toothed. Capsule subglobose, echinate or setose, indehiscent or separating into cocci. Seeds 1-2 in each cell, pendulous, albuminous; embryo straight; cotyledons flat, foliaceous.—Species 75.—Tropics.

1. Stamens 8-15 .... 1. *T. bartramia.*
2. Stamens 10-15 .... 2. *T. semitriloba.*

All the species are mucilaginous, demulcent, bechic, and diuretic.

The following species are used medicinally in the Philippine Islands and the West Indies—*T. semitriloba* Linn.—; in La Reunion—*T. glandulosa* Lam., *T. velutina* Vahl—; in Madagascar— *T. bartramia* Linn.—; in Guiana—*T. lappula* Linn.—; in Brazil—*T. eriocarpa* St. Hil., *T. semitriloba* Linn.—; in Southern Africa—*T. bartramia* Linn.—.

1. **Triumfetta bartramia** Linn. Syst. ed. 10 (1759) 1044.—*T. rhomboidea* Jacq. Pl. Carib. (1760) 22, nomen, et Select. Stirp. Amer (1763) 147, t. 90.—*T. trilocularis* Roxb. Fl. Ind. II (1832) 462.—PLATE 159 (under *T. rhomboidea* Jacq.).

Suffruticose, 0.6-1.5 m. high; branches slender, more or less pubescent with simple hairs. Leaves variable, stipules subulate; lower leaves 5-7.5 cm. diam., usually 3-lobed, irregularly serrate, clothed with simple and stellate hairs on both surfaces and simple hairs on the nerves beneath, base cordate or cuneate, the petioles up to 3.8 cm. long, more or less hairy; upper leaves usually simple, with very short petioles. Flowers 6 mm. across, yellow, in dense terminal

and leaf-opposed cymes; buds oblong apiculate; peduncles and pedicels very short; bracts subulate. Sepals oblong, hooded and apiculate at the apex. Petals shorter than the sepals, obovate-oblong, ciliate at the base; claw very long. Stamens 8-15. Fruit 4 mm. diam., the surface at the base of the spines araneously pubescent; spines glabrous, the bristle points hooked, very slender, transparent.

Distribution: Tropical and subtropical India, Ceylon, Malay Peninsula.—Malay Archipelago, China, Africa, America.

The root is bitter and acrid; tonic, styptic, galactagogue, aphrodisiac, cooling; useful in dysentery (Ayurveda).

The bark and fresh leaves are used for diarrhoea.

The leaves, flowers, and fruits are mucilaginous and astringent. They are given in gonorrhoea.

The root is used as a diuretic.

In Madagascar the pounded root is applied to boils and to inflamed eyelids, the pounded leaves and stem are used as a poultice on tumours.

Zulu women take a hot infusion of the root to facilitate childbirth or to hasten the inception of parturition when it is delayed.

Antsianaka: Besofimbavy, Besofinantanana—; *Bengal:* Bunokra—; *Betsileo:* Besofina, Kihasinkasina—; *Bombay:* Nichardi—; *Ewe:* Bobui—; *Goa:* Tupsado—; *Gujerati:* Jhipato—; *Hansot:* Bharvado—; *Hindi:* Chikti, Chiriyari—; *Hova:* Tsindailay, Tsitiamoty..; *Madras:* Adeiyotti—; *Marathi:* Jhinjhira, Jhinjudi, Kutrevandare, Nichardi—; *Sakalave:* Kisalenjy, Tsirijy—; *Sanskrit:* Jhinjharita, Jhinjhirita, Jhinjhurdi, Jhirpata, Kantaphali—; *Sinhalese:* Epala—; *Tamil:* Ottuppullu, Puramutti—; *Telugu:* Chirusitrika, Tutturubenda—; *Uriya:* Bojoromuli, Jotojoti—; *Zulu:* inDolaencane iNothwane—.

2. **Triumfetta semitriloba** Linn. Mant. 73.

Herbaceous or suffrutescent, pubescent villous or glabrescent; stem hispidulous. Leaves variable, cordate-ovate, sub-3-lobed, coarsely and irregularly toothed, 5-7-nerved, downy, upper leaves smaller, ovate-lanceolate; petioles 5-10 cm. Flowers in clusters along the sides of the branches. Buds oblong. Sepals apiculate.

1. **Corchorus capsularis** Linn. Sp. Pl. (1753) 529.—PLATE 160.

Annual, growing very tall under cultivation; stem and branches glabrous. Leaves 7.5-10 by 2-3.2 cm., lanceolate, acute or acuminate, glabrous, serrate, the lower serrature on each side usually prolonged into a filiform appendage, base rounded or acute; petioles reaching 3.8 cm. long, shorter upwards, slender, glabrous; stipules 6-12 mm. long, filiform. Flowers less than 12 mm. across, in short cymes; buds obovoid, shortly apiculate; peduncles short; pedicels 1-2, short. Capsules 12 mm. diam., subglobose, not beaked, depressed, broader than long, ridged and muricated, 5-valved; valves woody, without transverse septa. Seeds few in each cell, wedge-shaped, smooth, brown.

Distribution: Throughout the hotter parts of India. May have been introduced from China or Cochin-China.—Cultivated in most tropical countries.

A decoction of the dried root and unripe fruit is given in diarrhœa.

In cases of dysentery the dried leaves are eaten at breakfast time with rice. The cold infusion is also administered as a tonic in dysenteric complaints, fever, and dyspepsia.

It is a common practice in the jute-growing districts of Bengal to keep a small stock of the dried jute leaves in the house, whereof an infusion—a so-called tea—is made and taken by those suffering from any disorder of the liver. From the reports received by the Indigenous Drugs Committee it appears that the infusion is used as a popular domestic medicine for disorder of the liver and is of great value when there is a trouble with burning sensation in hands and feet. It is also used as a bitter tonic, stomachic, laxative, carminative, stimulant to increase appetite and flow of saliva and gastric juice; also as an antiperiodic, anthelmintic, astringent and intestinal antiseptic. It has been reported as efficacious in fever, bilious troubles, worms of children, dysentery, hepatic and intestinal colic, gastrilgia and gastric catarrh, skin diseases, especially itches, atonic dyspepsia, slight jaundice, and in the disorder of the digestive system.

The glucoside, which probably is the active principle, has been isolated and a small quantity was furnished by Mr. R. S. Finlow, Fibre Expert to Government, Dacca, for experiment by the Indigenous Drugs Committee. It was sent to Colonel Deare for trial in the Medical College Hospital who has expressed an opinion that it is undoubtedly a valuable gastric tonic in atonic dyspepsias increasing the "appetite juice" and thus aiding digestion.

In Indo China the flowers are given in epistaxis; the fruits are applied to swellings and abscesses, and prescribed in diseases of the bladder.

The chemical composition of the seeds has been determined by N. K. Sen (*Journ. Ind. Chem. Soc.;* 1927, 1928, 1930).

J. K. Chowdhury and M. N. Mitra have found galacturonic, glycuronic, and pectic acids present in the fibre (*Journ. Ind. Chem. Soc.*, June, 1932). The leaves have been examined for their chemical constitution by N. K. Sen (20th Ind. Sc. Congress; Patna, 1933).

Assam: Marasag, Titamara—; *Bengal:* Ghinalitapat, Narcha—; *Bombay:* Chouchen, Ghinaltapat, Narcha—; *English:* Jute—; *French:* Chanvre de Calcutta, Jute—; *Hindi:* Narcha—; *Indo China:* Bo day, Hoang ma, Ta ma—; *Marathi:* Chaunchan—; *Mundari:* Hatularita—; *Philippines:* Pasao, Pongloopongloan—; *Porebunder:* Borachhunchh, Chhunchh—; *Portuguese:* Juta—; *Sanskrit:* Kalasaka—; *Shahjahanpur:* Harrawa—; *Tagalog:* Pasaonabilog—; *Visayan:* Lamhay—.

2. **Corchorus olitorius** Linn. Sp. Pl. (1753) 529.—PLATE 161A.

Annual, 0.9-1.2 m. high, much-branched; stems glabrous. Leaves 6.3-10 by 3.8-5 cm., elliptic-lanceolate, acute or acuminate, glabrous, serrate, the lower serratures on each side prolonged into a filiform appendage over 6 mm. long, rounded at the base 3-5-nerved; petioles 2-2.5 cm. long, slightly hairy, especially towards the apex; stipules subulate, 6-10 mm. long. Flowers pale yellow; buds obovoid. angled, cuspidate; bracts lanceolate; peduncle shorter than the petiole; pedicels 1-3, very short. Sepals 3 mm. long, oblong,

apiculate. Petals 5 mm. long, oblong-spathulate. Style short; stigma microscopically papillose. Capsules 3-6.3 cm. long, linear, cylindric, erect, 10-ribbed, beaked, glabrous, 5-valved; valves with transverse partitions between the seeds. Seeds trigonous, black.

Distribution: Generally distributed in all tropical countries.

The leaves are sharp, hot, acrid; astringent to the bowels, alterative, alexiteric; remove tumours, pain, ascites, abdominal tumours, and piles (Ayurveda).

The dried plant, roasted and powdered, is used in visceral obstruction. In South India it is used as a demulcent.

The leaves are demulcent, tonic and diuretic, useful in some cases of chronic cystitis, gonorrhœa and dysuria.

The leaves and tender shoots are eaten, and in the dried state, known as *nalita;* they are used in infusion by the natives as a domestic medicine, being tonic and slightly febrifuge, and hence used as a fever drink.

The dried leaves are sold in the market. A cold infusion is used as a bitter tonic, and is devoid of any stimulating property. It can be safely given to patients recovering from acute dysentery to restore the appetite, and improve the strength.

The seeds are purgative.

Arabic: Molukhyia—; *Bengal:* Banpat, Bhungipat, Phunjipat, Koshta, Lalitapat, Pat—; *Bombay:* Chhunchh, Motichhunchh, Tankla—; *English:* Jew's Mallow—; *Ewe:* Sigli, Singgli—; *French:* Corěte, Corette, Corette potagěre, Guimauve potagěre, Mélochie—; *Gambia:* Alo—; *Greek:* Corchoros—; *Gujerati:* Chhunchho—; *Hausa:* Lalu, Malafiya, Marafiya, Turgunuwa—; *Hindi:* Koshta, Pata, Singinjanascha—; *Madras:* Sanel—; *Marathi:* Chunch, Motichunch—; *Mundari:* Larita—; *North-Western Provinces:* Banphal—; *Porebunder:* Chhunchhdo, Chhunchho, Motichhunchh—; *Punjab:* Banphal—; *Sanskrit:* Brihatchanchu, Dirghapatri, Divyagandha, Kalasa, Mahachanchu, Nadika, Patta, Singgika, Sthulachanchu, Suchanchuka, Vishari—; *Sind:* Banpat—; *Tamil:* Peratti, Punaku—; *Telugu:* Parinta, Parintakura—; *Uriya:* Jhoto, Joto, Kaunria—.

3. **Corchorus trilocularis** Linn. Mant. (1767) 77.—PLATE 162.

Annual; stems and branches more or less hairy. Leaves 2.5-10 by 2-3.2 cm., elliptic or oblong-lanceolate, acute or obtuse, serrate (the lower serratures often destitute of filiform appendages), somewhat rough below, base rounded or cuneate; petioles 6-12 mm. long, pilose; stipules lanceolate-subulate. Flowers in short cymes; buds ovoid or obovoid apiculate; bracts lanceolate-subulate; peduncles very short, leaf-opposed, hairy; pedicels very short, pubescent. Sepals 6 mm. long, linear-oblong, acuminate. Petals oblong, slightly longer than the sepals. Capsules 5-7.5 cm. long, with a short erect beak, hairy when young with stiff stellate hairs, scabrous when old, 3-4-angled, 3-4-valved; valves with transverse partitions between the seeds. Seeds trigonous, black.

Distribution: Bihar, Deccan and Carnatic of Madras and Bombay Presidencies, Khandesh, Gujarat, Cutch, Sind, Baluchistan.—Afghanistan, Arabia, tropical and S. Africa.

The medicinal properties are the same as those of *C. fascicularis* (Ayurveda).

The plant, macerated for a few hours in water, yields a mucilage, prescribed as a demulcent.

The seeds are bitter and administered in doses of about 80 grains in fever and obstruction of the abdominal viscera.

Bombay: Kaduchhunchh, Kuruchuntz—; *Canarese:* Tandassir—; *Gujerati:* Kadvichhunchhdi—; *Hausa:* Lalu, Turgunuwa—; *Hindi:* Kadukosta, Kadvapat—; *Marathi:* Kaduchunch—; *Nasirabad:* Datrab—; *Porebunder:* Lambichhunchh—; *Sanskrit:* Dirghachanchu, Kaunti—.

4. **Corchorus fascicularis** Lam. Encycl. II (1786) 104.—PLATE 161B.

Annual, 15-45 cm. high, much-branched from the base; stem and branches terete, glabrous. Leaves 2-4 by 0.6-1.2 cm., elliptic-oblong, obtuse, serrate, the lower serratures not (or rarely) produced into filiform appendages, glabrous, base rounded or cuneate; petioles very short, pilose; stipules lanceolate-subulate. Flowers in very short (almost sessile), leaf-opposed cymes; buds obovoid apiculate;

bracts long, lanceolate; peduncles 2-5-flowered. Sepals 2 mm. long, linear, apiculate. Petals oblong-obovate. Capsules 12 mm. long, shortly beaked, straight, cylindric, pubescent, 3-valved; valves slightly septate between the seeds. Seeds wedge-shaped black, smooth.

Distribution: Hotter parts of India.—Tropical Africa and Australia.

The plant is sweet, hot, acrid; astringent to the bowels; removes tumours, ascites, piles; cures dysentery.—The leaves are tasty and savoury; cooling laxative, stimulant, tonic, aphrodisiac; destroy "tridosha."—The seeds are hot with a sharp taste; alexipharmac; remove tumours, pain, stomach troubles, skin diseases, scabies (Ayurveda).

The plant is anthelmintic; useful in discharging ulcers (Sushruta).

It is very mucilaginous and somewhat astringent, and is valued as a restorative.

In Bombay, a watery extract, mixed with sugar-candy, is taken as a nutritive tonic.

Bengal: Banpat Bilnalita, Janglipat—; *Bombay:* Bhauphali, Hirankhori, Mothibahuphali—; *Gujarat:* Chhunchhadi, Ubhibahuphali—; *Hindi:* Bankosta, Khetapat—; *Marathi:* Hirankuri, Motibahuphali—; *Poona:* Magarmithi—; *Porebunder:* Chhunchhadi, Ubhibahuphali—; *Sanskrit:* Bhirupatrika, Chanchu, Chanchuputra, Chanchura, Chhunchhu, Chincha, Diaghpatri, Kalabhi, Kshestrachhunchhu, Kshestrasambhava, Sushaka, Vijala—.

5. **Corchorus depressus** Stocks in Proc. Linn. Soc. I (1848) 367.—*Antichorus depressus* Linn. Mant. (1767) 64.—*Corchorus Antichorus* Raeusch. Nom. Bot. ed. 3 (1797) 158; Cke. I, 150.—*Jussiaea edulis* Forsk. Fl. Aeg-Arab. (1775) 210.—*Corchorus microphyllus* Fres. in Mus. Senckenb. II (1837) 156.—*C. humilis* Munro ex Stocks in Proc. Linn. Soc. I (1848) 367.—Plate 163 (under *C. Antichorus* Raeusch).

Perennial, 15-23 cm., prostrate, much-branched from the base; branches twisted, imbricate, woody. Leaves 6-20 by 6-12 mm., roundish, usually wrinkled, glabrous, irregularly crenate-serrate, the serratures not appendaged, base rounded or cuneate; petioles 1.2-2.5

cm. long, very slender; stipules subulate. Flowers numerous, on leaf-opposed cymes; buds obovoid, apiculate; bracts lanceolate-subulate; peduncles and pedicels very short. Sepals 4.5 mm. long, linear-oblong, apiculate. Petals longer than the sepals, oblong-obovate. Capsules 1-1.5 cm. long, cylindric, beaked, glabrous, often curved upwards, 4-valved; valves scarcely, if at all, septate between the seeds. Seeds trigonous, black.

Distribution: Punjab, Sind, Baluchistan, Cutch, Gujarat, Deccan.—Afghanistan, Arabia, N. Africa, Cape Verde Islands, tropical Africa.

The plant is sweetish, hot, sharp, acrid; removes tumours and pain; cures piles (Ayurveda).

The plant has tonic properties. It is given as a cooling medicine in fevers.

The leaves are emollient.

The seeds in decoction with milk and sugar are given as a tonic.

The mucilage is used in Sind for gonorrhœa.

Baluchistan: Mandira, Mundheri—; *English:* Shrubby Jute—; *Gujerati:* Bahuphali, Bethibahuphali, Chhikni, Chhunchh—; *Hindi:* Baphuli—; *Marathi:* Bahuphali—; *Punjab:* Babuna, Bahuphalli, Bophalli, Kurana—; *Sanskrit:* Bhedani, Chanchu, Katuka, Kshudra, Kshudrachanchu, Patupatrika, Shunakachanchuka, Tvakasara—; *Sind:* Mudhiri—; *Uriya:* Bojoromuli—.

ELAEOCARPUS Linn.

Trees. Leaves simple, entire or serrate. Flowers in racemes, rarely polygamous. Sepals 4-5, valvate (rarely imbricate), distinct. Petals as many as the sepals, laciniate, lobed or rarely entire, inserted round the base of a thickened glandular torus. Stamens numerous (rarely 8-12), inserted on the torus, between the glands; anthers linear, dehiscing by a transverse valve at the apex. Ovary 2-5-celled; ovules 2 in each cell; style subulate, entire. Drupe with a single bony tuberculate stone, 3-5-or (by suppression) 1-celled; cells 1-seeded. Seeds pendulous; testa crustaceous or bony; albumen fleshy; cotyledons broad, flat or undulate.—Species 90.—Tropics.

A. Anthers not terminated by an awn
   I. Drupe 5-celled .... 1. *E. ganitrus.*
   II. Drupe 1-3-celled
      a. Anthers bearded. Filaments short, straight .... 3. *E. serratus.*
      b. Anthers rarely bearded. Filaments long, twice bent .... 2. *E. oblongus.*
B. Anthers terminated by a long awn
   Leaves obovate. Stone much tubercled .... 4. *E. tuberculatus.*

E. photiniaefolia Hook. and Arn. is used medicinally in Indo China; *E. madepolatus* Pierre in Cambodia.

1. **Elaeocarpus ganitrus** Roxb. Hort. Beng. (1814) 42.

A tree. Leaves 10-15 by 2.4-4.5 cm., oblong-lanceolate, acute or acuminate (rarely obtuse), obscurely and irregularly crenate-serrate or subentire, decurrent into the petiole, glabrous; petioles 6-10 mm. long. Racemes 5-7.5 cm. long, from the old wood; buds ovoid-conical, pointed; pedicels 6 mm. long. Sepals 6 mm. long, oblong, acuminate, pubescent outside. Petals 8 mm. long, oblong, laciniate about half way down, ciliolate. Stamens about 40, in groups opposite each petal; filaments very short; anthers linear, one valve tipped at the apex with a small tuft of glistening hairs. Ovary pilose, 5-celled; style longer than the stamens. Drupes 1.3-2 cm. diam., globose or somewhat obovoid, purple; stone tubercled, 5-celled, 5-seeded.

Distribution: W. Ghats and Konkan of the Bombay Presidency, Nepal, Bengal, Burma, Siam, Malay Peninsula and Malaya.

The fruit is sour, heating; useful in "vata," "kapha," diseases of the head, epileptic fits (Ayurveda).

Bengal: Rudrakya—; *Canarese:* Rudraksha—; *Hindi:* Rudrak—; *Malayalam:* Rudraksham—; *Marathi:* Rudraksh—; *Sanskrit:* Amara, Bhutanashana, Harksha, Nilakanthaksha, Pavana, Pushpachanamara, Rudraksha, Sharvaksha, Shivaksha, Shivapriya, Trinameru—; *Tamil:* Akkam, Irrattaiyuruttirasham, Kaurichangamani, Uruttiradcham, Uruttirakkam—; *Telugu:* Rudrachallu—; *Tulu:* Rudraksha—; *Uriya:* Rudrakhyo—.

2. **Elaeocarpus oblongus** Gaertn. Fr. I (1788) 202, t. 43. —Wight Ic. t. 46.

A tree, the foliage often tinged with red. Leaves 7.5-10 by 4.5-5 cm., elliptic, acute or acuminate, crenate-serrate with a small glandular point at each of the crenatures, quite glabrous, shining, base cuneate; petioles 2-3.2 cm. long, more or less pubescent. Flowers in racemes from the axils of fallen leaves; buds ovoid or subglobose; peduncles 7.5-12.5 cm. long, red; pedicels 6-16 mm. long red. Sepals 5 mm. long, ovate, acute, reddish brown. Petals 6-8 mm. long, white, fringed to about half way down or a litlle less, ciliolate. Stamens about 45, in groups of about 9 opposite each petal; filaments long, curved outwards at the base, abruptly incurved at the apex; anthers not (or rarely?) bearded at the apex, the valves puberulous. Ovary pilose; style short, conical, hairy. Drupes 2.5-3.2 cm. long, oblong, narrowed at both ends; stone 2-celled, 2-seeded.

Distribution: W. Peninsula.—Malaya.

The fruit is used as an emetic. It is also given for rheumatism, pneumonia, ulcers, piles, leprosy, and dropsy.

Badaga: Bikki—; *Canarese:* Bikki, Hanaltadi, Hanillatade, Hennalatade—; *Malayalam:* Kattakara, Malankara—; *Tamil:* Kattukkarai—; *Visayan:* Cabalte, Cabilte—.

3. **Elaeocarpus serratus** Linn. Sp. Pl. (1753) 515.—*E. cuneatus* Wight Ill. I, 83.

A small tree; young parts pubescent. Leaves 5-11.5 by 2.5-5 cm., oblong or obovate, obtuse, acute or shortly acuminate, irregularly crenate, glabrous, often with glandular thickenings in the nerve-axils, base acute; petioles 13-20 mm. long, glabrous. Flowers in drooping racemes 5-7.5 cm. long, in the axils of fallen leaves; buds ovoid; pedicels 6-10 mm. long. Sepals 6 mm. long, lanceolate, acute. Petals 8 mm. long, white, cuneate-obovate, laciniate halfway down. Stamens about 30; filaments short; anthers linear, one valve tipped at the apex with a small tuft of glistening hairs. Ovary pilose, 3-celled; style slender, longer than the stamens, the basal part hairy. Drupes 2.5-3.2 cm. long, oblong, narrowed at the base, bluntly pointed at the apex, greenish yellow, smooth; stone oblong, pointed, much-tubercled, 1-celled, 1-seeded.

Distribution: W. Peninsula, Ceylon.—Malaya.

The leaves are used in rheumatism, and as an antidote to poison. The fruits are prescribed in dysentery and diarrhœa.

Bengal: Jalpai—; *Canarese:* Bigada, Guddarenje, Perinkara—; *Malayalam:* Avil, Karamavu, Nallakara, Perunkara, Valiyakara—; *Sanskrit:* Chiribilva—; *Sinhalese:* Weralu—; *Tamil:* Ulangarai, Uruttiracham—; *Tulu:* Rahubija—; *Uriya:* Jolopari—.

4. **Elaeocarpus tuberculatus** Roxb. Hort. Beng. (1814) 93. —*Monocera tuberculata* Wight & Arn. Prodr. 83; Wight Ill. I, 35.

A large tree. Leaves 12.5-20 by 6.3-10 cm., obovate-cuneate, obtuse, obscurely crenate-dentate or subentire, strongly penni-nerved, glabrous above, fulvous-pubescent on the nerves beneath, base usually rounded; petioles 2.5 cm. long, more or less hairy. Flowers very numerous, in rusty-pubescent racemes 5-10 cm. long; buds ovoid, acute; pedicels up to 2.5 cm. long. Sepals 13-14 mm. long, oblong-lanceolate or linear-oblong, acute, fulvous-pubescent without and with a few hairs within. Petals a little longer than the sepals, wedge-shaped, hairy at the base inside, silky villous outside, laciniate one-third of the way down. Stamens 40-50; filaments 2 mm. long, anthers slender, linear, each with an erect awn 2.5-3 mm. long, which is often slightly curled or twisted. Ovary conical, silky-villous, 2-celled; style silky near the base, rapidly tapering from base to apex. Drupes 3.8-5 cm.; stone compressed, tubercled on the flattened sides and with a thickened margin.

Distribution: W. Peninsula.—Malaya.

A decoction of the bark is given in hæmetemesis, and biliousness.

The nuts are used in rheumatism, typhoid fever, and epilepsy.

Badaga: Rudraksha—; *Canarese:* Dandele, Rudraksha—; *Hindi:* Rudrak—; *Kadir:* Navati, Pagumbal, Pillahi, Pulandi—; *Malayalam:* Ammakkaram, Kotuvasi, Nakara, Navati, Pillahi—; *Tamil:* Pagumbal, Uruttracham—.

LINACEAE.

Herbs or shrubs. Leaves simple, alternate or opposite; stipules present or absent, sometimes gland-like or intrapetiolar. Flowers hermaphrodite, actinomorphic; sepals 4-5, free or partially united, imbricate; petals contorted, fugacious, free, often clawed, claw naked or crested; stamens the same number as the petals and alternate with them, sometimes alternating with small staminodes; filaments connate at the base; anthers introrse, 2-celled, opening lengthwise; ovary superior, 3-5-celled, cells of ten again subdivided nearly to the placentas; ovules 2 in each cell; styles 3-5, filiform, free, with simple subcapitate stigmas. Fruit a capsule, septicidally dehiscent. Seeds compressed, shining; endosperm copious, scanty or absent; embryo straight, with flat cotyldons.—Genera 9. Species 150.—Cosmopolitan.

A. Petals contorted, fugacious. Perfect stamens as many as the petals. Herbs rarely shrubs
  I. Calyx glabrous or pubescent. Styles 5. Capsule 5-celled .... LINUM.
  II. Calyx glabrous. Styles 3-4. Capsule 3-4-celled .... REINWARDTIA.
B. Petals contorted, fugacious. Perfect stamens 2-3-times as many as the petals. Fruit a drupe. Usually scandent shrubs.
  Sepals subacute, tomentose, ebracteolate .... HUGONIA.

The seeds are oleaginous, emollient, and sometimes purgative.

Glucosides—linamarin, phaseolunatin—are among the products isolated from the genus LINUM. Linin, a peculiar drastic principle has been obtained from *L. catharticum* Linn.

OFFICIAL:—*Linum usitatissimum* Linn. (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden, Switzerland, Turkey, United States).

LINUM Tourn. ex Linn.

Herbs sometimes suffrutescent, usually glabrous. Leaves generally alternate, narrow, entire, 1-many-nerved; stipules 0 or glanduliform. Inflorescence various. Sepals 5, entire. Petals 5, contorted, fugacious. Stamens 5, connate at the base, hypogynous, alternate with the petals, often alternating with minute or setiform

staminodes; glands 5, small, adnate to the staminal tube outside, opposite to the petals. Ovary 5-celled, the cells imperfectly septate, 2-seeded, or with a perfect, fissile septum, 10-valved, 1-seeded. Seeds compressed; albumen scanty; embryo straight.—Species 90.—Temperate and subtropical, especially Mediterranean.

A. Petals blue
 I. Capsule scarcely exceeding the narrowly white-margined sepals .... 1. *L. usitatissimum.*
 II. Capsule much longer than the white-margined sepals .... 2. *L. perenne.*
B. Petals yellow .... 3. *L. strictum.*

The seeds are mucilaginous and emollient.

The following are used medicinally in Europe—*L. alpinum* Linn., *L. angustifolium* Huds., *L. austriacum* Linn., *L. catharticum* Linn., *L. gallicum* Linn., *L. flavum* Linn., *L. hirsutum* Linn., *L. maritimum* Linn., *L. narbonense* Linn., *L. nodiflorum* Linn., *L. perenne* Linn., *L. strictum* Linn., *L. suffruticosum* Linn., *L. tenuifolium* Linn., *L. usitatissimum* Linn., *L. viscosum* Linn.—; in China —*L. perenne* Linn.—; in Brazil—*L. usitatissimum* Linn.—; in Uruguay—*L. selagenoides* Lam.—; in Chili—*L. chamissonis* Macraei, *L. selagenoides* Lam.—; in Southern Africa—*L. thunbergii* E. & Z.

OFFICIAL:—The seeds of *L. usitatissimum* and the oil from them in all pharmacopœias.

1. **Linum usitatissimum** Linn. Sp. Pl. (1753) 277.—PLATE 164A.

Annual, 0.6-1.2 m. high; stems solitary or few, corymbosely branched; branches ascending towards the apex. Leaves up to 3.8 cm. long, linear-lanceolate, attenuated at both ends, acute at the apex. Flowers about 2.5 cm. across, in corymbose panicles. Sepals: The 2 outer elliptic, acuminate, with enitre membranous margins; the 3 inner broader, acuminate, with ciliate margins, all strongly 3-nerved, the middle nerve alone reaching the apex. Petals blue, slightly crenate. Capsules mucronate, the edge of the dissepiments in the interior glabrous. Seeds compressed, ellipsoid, smooth, dark brown, shining.

Distribution: Cultivated throughout India up to 6,000 ft.—Native country probably Egypt.

The seeds are sweet, slightly bitter, oily, hot, hard to digest; tonic, aphrodisiac; remove biliousness, backache, inflammation; heal ulcers, urinary discharges, cure leprosy; remove "vata", "pitta", "kapha"; bad for the eyesight; lead to impotency; used in consumption.—The leaves remove "vata", cough, and asthma (Ayurveda).

The seeds are mucilaginous and bad to the taste; diuretic, aphrodisiac, galactagogue, emmenagogue, good for cough, and kidney troubles.—The bark and leaves are good for gonorrhœa. The bark burnt and applied to wounds, is styptic and heals them. The flowers are a tonic to the brain and the heart.—The oil from the seeds removes biliousness and bad blood; useful for internal wounds, and ringworm; causes loss of appetite (Yunani).

The roasted seeds are said to be astringent. Fumigation with the smoke is recommended for colds in the head and hysteria and the tinder is used to staunch hæmorrhages.

The seeds are used internally for gonorrhœa and irritation of the genito-urinary system. The flowers are considered a cardiac tonic (Emerson).

Linseed poultice is recommended for gouty and rheumatic swellings; as an emollient, the mucilage is dropped into the eye; with honey it is prescribed in coughs and colds.

In Europe the meal of the seeds is used for cataplasms. The infusion is demulcent and emollient. The oil mixed with limewater has been a favourite application to burns.

A cyanogenetic glucoside, phaseolunatin, is contained in the young plant.

The dried ripe seeds are used as a demulcent, and in the form of poultices. They contain from 30 to 40 per cent of fixed oil, and about 6 per cent of mucilage. Linseed oil is obtained from the seed for medicinal purposes by cold expression. The chemistry of the oil is dealt with in text-books on oils.

Annam: Ho ma—; *Arabic:* Bazarulkatan, Bazrutkattan, Kattan—; *Behar:* Chikna, Tisi—; *Bengal:* Masina, Tisi—; *Bombay:* Alasi, Javas, Javasa—; *Brazil:* Linho—; *Canarese:* Alashi, Alsi—; *Catalan:* Lli—; *Celtic:* Lin—; *Chinese:* Hou Ma Tse—; *Danish:* Hoerfroe, Hoerre, Hor—; *Deccan:* Alshi,

Javas—; *Dutch:* Vlas—; *English:* Blaebows, Common Flax, Flax, Flix, Lin, Line, Lint, Lint Bells, Lint Bennels, Lint Bow, Lyne, Vlix—; *French:* Lin, Lin chaud, Lin commun, Lin cultivé—; *German:* Flachs, Haarlinsen, Lein, Saatlein—; *Greek:* Linon—; *Gujarat:* Alshi—, *Hebrew:* Bad—; *Hindi:* Alsi, Tisi—; *Hungarian:* Len—; *Italian:* Lino—; *Kashghar:* Zighir—; *Kashmir:* Alish, Keun—; *Konkani:* Sonnbiam—; *Kumaon:* Alsi, Tisi—; *Loralai:* Alsi—; *Madagascar:* Rongonimbazaha—; *Madras* Ali—; *Malayalam:* Cheruchanavittintevilta—; *Marathi:* Alashi, Javasa—; *North-Western Provinces:* Bijri—; *Persian:* Bazarug, Kuman, Tukhmekatan, Zaghir, Zaghu—; *Polish:* Len—; *Porebunder:* Alasi, Javas—; *Portuguese:* Linhaca, Linho—; *Punjab:* Alish, Alsi, Tisi—; *Roumanian:* In—; *Russian* Len, Lyon—; *Sanskrit:* Atasi, Auma, Chanaka, Devi, Haimwati, Kshauma, Kshaumi, Kshuma, Madagandha, Madotkata, Malina, Masina, Masrina, Masruna, Masuna, Nilapushpi, Nilpushpika, Parvathi, Pichhila, Budrapatni, San, Sunila, Suverchala, Tailottama, Uma—; *Spanish:* Lino—; *Tamil:* Alshi—; *Telugu:* Atasi, Madanginjalu, Ullusulu—; *Turki:* Ziggar—; *Turkish:* Keten—; *Urdu:* Alasi—; *Uriya:* Pesu—.

2. **Linum perenne** Linn. Sp. Pl. 277.

Perennial. Stems many from the roots, 0.3-0.9 m. high. Leaves 1.3-2 cm., without stipular glands, all lanceolate or lower oblong obtuse and upper linear acute. Cymes few-flowered, racemose. Flowers 2.5 cm. broad. Sepals ovate or obovate, 3-5-nerved with glandular margins; petals blue entire, styles quite free, stigmas subcapitate. Capsule as large as a pea, much longer than the white-margined sepals, on a slender pedicel.

Distribution: N.-W. Himalaya.—Westwards to the Canaries.

In Europe and in China the seeds are considered emollient.

Chinese: Ya Ma—.

3. **Linum strictum** Linn. Sp. Pl. 279.

An annual plant, 30-50 cm. high, or sometimes somewhat more, glabrous; stem at first slender, becoming stout and stiff, corymbose. Leaves crowded, linear-lanceolate, acute, very rough. Flowers

5 mm. long; fruiting pedicels thickened, shorter than the capsule; sepals lanceolate, acuminate, two-thirds as long as the 5 mm. long corolla, twice as long as the capsule.

Distribution: Punjab, N.-W. Himalaya.—From Soongaria to the Mediterranean.

The seeds are used as an emollient in Spain.

Reinwardtia Dum.

Undershrubs. Leaves alternate, membranous, usually serrate, penninerved; stipules minute, caducous. Flowers large, yellow or white, in very short fasciculate axillary racemes or in dense corymbs at the ends of the branches; pedicels bracteate. Sepals 5, entire. Petals 5, contorted, fugacious. Stamens 5, connate at the base, hypogynous, with as many interposed setiform staminodes. Glands 2-3, adnate to the staminal tube. Ovary 3-5-celled, cells 2-locellate; ovule 1 in each locellus; styles 3-4 (rarely 5 or 7), filiform, stigmatose at the apex. Capsule globose, splitting into 6-8 valves; valves 1-seeded. Seeds reniform; albumen thin; embryo straight.—Species 1.

1. **Reinwardtia trigyna** Planch. in Hook. Lond. Journ. Bot. VII (1848) 522.—*R. tetragyna* Planch. l. c. 523.—Plate 164B.

A glabrous shrub, 0.6-0.9 m. high, branches erect or prostrate and rooting. Leaves 2.5-10 cm. long, elliptic-lanceolate or oblanceolate, acute, decurrent into a short petiole, entire or minutely crenate-serrate, glabrous, mucronate, pale beneath; stipules minute, subulate, caducous. Flowers mostly solitary and axillary, yellow, showy, about 3.8 cm. across. Sepals 5, lanceolate, acute, 12.7-15 mm. long. Petals 5, contorted, obovate, cuneate, about 2.5 cm. long. Stamens 5, connate at the base, hypogynous, with as many interposed staminodes, in some flowers shorter, in others longer than the style. Glands 2-3 adnate to the staminal tube. Ovary 3-5-celled, cells 2-locellate; ovules one in each locellus; styles normally 3, free or connate at the base, sometimes 4, 5 or 7 of different lengths. Capsule globose, the size of a pea, shorter than the persistent sepals.

Distribution: Along the Himalaya from the Indus eastwards, Salt Range, Trans-Indus, Simla, Kumaon to Sikkim up to 6,000 ft., Assam, Chittagong, Bihar, Mt. Abu,

Bombay Konkan and Ghats, W. Ghat forests of S. Kanara and Mysore.—Tonkin, Siam, China.

Used as a medicine for cattle.

Deccan: Abai—; *Dehra Dun:* Basant—; *Jaunsar:* Pengun—; *Kumaon:* Piuli, Piunli—; *Punjab:* Balbasant, Basant, Gudbatal, Gulashruf, Karkun, Kaur—; *Saora:* Labodatar—.

HUGONIA Linn.

Scandent shrubs, often tomentose. Leaves alternate, penninerved, stipulate. Inflorescence various; flowers yellow, the 2 lowest peduncles of each branch converted into spiral hooks. Sepals 5. Petals 5, hypogynous, contorted, fugacious. Stamens 10, connate at the base into a short tube, with glandular swellings between the petals. Ovary 5-celled; ovules 2 collateral in each cell; styles 5, filiform, stigmatose at the apex. Drupe globose, fleshy or baccate. Seeds compressed, albuminous; embryo straight or slightly curved; cotyledons flat; radicle short.—Species 11.—Palaeotropics.

H. serrata Lam. is used as a tonic and sudorific in La Reunion.

1. **Hugonia mystax** Linn. Sp. Pl. (1753) 675; Wight Ill. I, 79, t. 32.—PLATE 165.

A rambling scandent shrub; branches yellow-tomentose, with short horizontal branchlets, leafless below and provided near the ends with a pair of circinate hooks. Leaves 3.8-6.3 by 2.5-3.8 cm., elliptic-obovate, obtuse or subacute, entire, reticulately veined, the veins conspicuous on both surfaces, glabrous, base tapering; petioles 1.5 mm. long, hairy; stipules lanceolate-subulate. Flowers at the extremities of the short branchlets 2.5-3.2 cm. across, terminal and in the upper axils; pedicels short, 1-flowered, clothed with soft yellow hairs. Sepals 7.5 mm. long, ovate-lanceolate, acute, fulvous-pubescent. Petals many times longer than the sepals, thin, ovate-oblong, acute or truncate. Styles longer than the stamens; stigmas capitate. Drupes about 1 cm. diam.; globose, surrounded by the persistent sepals; pulp scanty; stone bony, grooved, 10-celled, with usually 2 or 3 seeds.

Distribution: Konkon and N. Kanara of Bombay Presidency, throughout the dry forests of the Madras Presidency, Ceylon.

The bruished roots are employed externally in reducing inflammatory swellings, and as an antidote to snake-bites. In the form of a powder, it is administered internally as an anthelmintic and febrifuge. The bark of the root is also employed as an antidote to poisons.

The root is not an antidote to snake venom (Mhaskar and Caius).

Canarese: Modirakkanni—; *English:* Climbing Flax—; *Malayalam:* Moderakkanni, Motirakkanni—; *Sinhalese:* Bugatteya, Mahagetiya—; *Tamil:* Agori, Kodivirai, Modirakkanni—; *Telugu:* Gatrinta, Kakibira, Penkebedali, Pisangi, Renangi, Tivvaputiki, Ungaralapidemu, Vendapa—; *Tulu:* Mullankola—.

ERYTHROXYLACEAE.

Trees, shrubs or undershrubs. Leaves alternate, rarely opposite, simple, entire; stipules intrapetiolar, rarely extrapetiolar, often caducous. Flowers fasciculate, hermaphrodite, rarely subdioecious, hyopogynous, actinomorphic. Calyx persistent, campanulate, lobes 5, imbricate. Petals 5, free, deciduous, imbricate, mostly ligulate on the inside. Stamens 10, 2-seriate, more or less connate at the base; anthers ellipsoid, 2-celled, opening lengthwise. Ovary tricarpellary, 3-celled, mostly 2 of the cells sterile, fertile cells 1-2-ovuled; ovules pendulous, anatropous. Styles 3, free or more or less connate. Stigmas oblique, depressed-capitate or clavate. Fruit drupaceous. Seeds with or without endosperm. Embryo straight.—Genera 2. Species about 200.—Tropics.

The members exhibit a variety of properties: tonic, astringent, stimulant, refrigerant, laxative, and diuretic.

They contain a large number of alkaloids:—cinnamylcocaine, cocaine, cuscohygrine, hygrine, β-hygrine, tropacocaine, α-truxilline, β -truxilline, benzoylecgonine.

The hygrines form a group quite distinct from the other alkaloids. They have no physiological action.

Official:—Cocaine (France, Great Britain, Spain, United States);—hydrochloride (all pharmacopoeias);—nitrate (Germany).

Erythroxylon spp. (Great Britain, United States);

E. Coca Lamk. (Great Britain, Italy, Portugal, Switzerland, Turkey, United States); *E. Coca* Lam. var. *Bolivianum* Burck. (Belgium); *E. Coca* Lam. var. *bolivianum* Burck. var. *novagranatense* Morris (France, Spain).

Erythroxylon Linn.

Shrubs or trees, usually glabrous. Leaves alternate, entire, often nearly distichous; stipules intrapetiolar, on the arrested shoots imbricating. Flowers axillary, small, whitish, solitary or fascicled. Sepals 5-6. Petals 5-6, with an erect double ligule on the inner side. Stamens 10-12, monadelphous. Ovary 3-4-celled; styles 3-4, united into a style with capitate stigmas; ovules 1-2 in each cell. Drupe 1-celled, 1-seeded. Seed with a thin testa, and little or no albumen. —Species 200.—Warm countries, chiefly America.

1. Flowers axillary, generally in fascicles of 1-4 .... 1. *E. monogynum.*
2. Flowers in clusters of 3-5, yellow, 5-lobed .... 2. *E. coca.*

The leaves have a slight bitter tonic effect as well as a stimulant action upon the central nervous system. The wood and bark have stomachic, diaphoretic, and stimulant diuretic properties.

The following are used medicinally in Tongking—*E. coca* Lam.—; in La Reunion—*E. laurifolium* Lam.—; in Madagascar—*E. myrtoides* Bojer—; in South America—*E. anguifugum* Mart., *E. areolatum* Linn., *E. campestre* St. Hil., *E. coca* Lam., *E. hondense* H. B. & Kunt., *E. suberosum* St. Hil., *E. tortuosum* Mart.—.

Official:—Leaves of *Erythroxylon spp.* (Great Britain, United States); *E. Coca* Lam. (Great Britain, Italy, Portugal, Switzerland, Turkey, United States); *E. Coca* Lam. var. *Bolivianum* Burck. (Belgium); *E. Coca* Lam. var. *bolivianum* Burck. var. *nova-granatense* Morris (France, Spain).

1. **Erythroxylon monogynum** Roxb. Corom. Pl. I, t. 88.—*E. indicum* Bedd. Fl. Sylv. t. 81.—*Sethia indica* DC. Prodr. I, 576; Wight Ill. t. 48.—PLATE 166.

A shrub or small tree with dark rough brown bark. Leaves 2.5-5 cm. by 1.5-2.5 cm., cuneate, obovate, or elliptic— or cuneate-obovate, with the tip rounded, dull, not shining, glaucous-brown beneath when dry, nerves oblique, much reticulated; stipules triangular, long, acuminate. Peduncles 6-8 mm. long; flowers axillary, generally in fascicles of 1-4; style 3-fid at top. Drupe oblong, apiculate, bright scarlet, supported by the persistent sepals and stamens, 1-celled, 1-seeded.

Distribution: Madras Presidency: N. Circars, Deccan and Carnatic in dry evergreen forests, W. Ghats in dry hill forests of Travancore up to 3,000 ft., Ceylon.

According to Moodeen Sheriff an infusion of the wood and bark is stomachic, diaphoretic and stimulant diuretic; useful in some slight cases of dyspepsia and continued fever, and also in dropsy as an adjuvant to some other and more active medicines. The leaves are refrigerant.

Small quantities of alkaloids have been found in the leaves.

The oil isolated by steam distillation of the wood is a mixture of sesquiterpenes and sesquiterpene alcohols. In the sesquiterpene portion the presence of bisabolene has been established (Sanjiva Rao, Shintre, and Simonsen).

Badaga: Huli—; *Canarese:* Adavigorante, Devadaru, Gandhagiri, Jivadane, Kuruvakumara, Sambulikayi—; *Deccan:* Natkadeodar—; *English:* Bastard Sandal, Deccany Deodar, Red Cedar—; *Malayalam:* Devataru, Sem..; *Nilghiris:* Benade..; *Tamil:* Dasadaram, Devadaram, Devadari, Kadavulardaram, Kattusandanam, Kurardurumam, Sammanati, Sembulichan, Semmanalli, Semmanam, Simpulicham, Simpulichan, Sem, Tevadaram, Tevadari, Tevadaru—; *Telugu:* Adavigoranta, Devadari, Devadaru, Gadara, Gatiri, Gatrinta, Pagadapukatta, Paribhadrakamu, Paribhavyamu.

2. **Erythroxylon coca** Lam. Encyc. II, 393.

Shrub, 1.5-1.8 m. high, with rusty brown, slender branches on the extreme tips of which the leaves are borne; below the leaves, on

the wood of the preceding year, which is reddish, clusters of 3-5 yellow 5-lobed flowers 6 mm. across spring from the protection of the small scales that line the branchlets, and which are coloured like the bark. Leaves oval, obovate, or elliptical, differing in different cultivated strains or varieties, about 3.8-6.3 cm. long and marked on the under side with 2 lines extending on either side of the midrib from base to apex.

Distribution: Cultivated.—Indigenous in Peru.

A powerful stimulant of the nervous system, affecting it in a manner analogous to opium. Less violent in its effects than that drug, but more permanent in its action.

In South America coca leaves are chewed with lime by the Indians as a stimulant, and are largely exported to Europe for use in medicine and for the preparation of cocaine.

The leaves contain 0.4 to 0.8 per cent alkaloid, largely cocaine.

The plant contains methyl salicylate, and acetone has been found in the distillate from the leaves.

English: Bolivian Coca, Coca Bush, Cocaine Plant, Huanuco Coca, Spadic Bush—; *French:* Coca, Haschish des Mexicains, Haschish des Péruviens—; *Peru:* Chuichicoca, Cuca—; *Spanish:* Coca, Cuca—; *Tamil:* Sivadari—; *Tupin:* Ypadu—; *Turkish:* Koka—.

MALPIGHIACEAE.

Trees or erect or climbing shrubs. Leaves usually opposite and entire; stipules small or 0. Flowers bisexual, often irregular; pedicels jointed, bracteate. Sepals usually 5, imbricate, one or more usually furnish with large glands. Petals 5, usually equal, fimbriate or dentate, often clawed. Disk small. Stamens usually 10, 1 or more sometimes much longer than the others; filaments free or connate at the base. Ovary 3-celled; cells 1-ovuled, styles 1-3. Fruit of

Nepal, E. Bengal, Assam, Burma, Andamans, Malay Peninsula.—Siam, China, Malay Archipelago to Formosa and the Philippines.

The leaves and bark are hot, acrid, bitter, insecticide, vulnerary; remove "tridosha," biliousness, cough, burning sensation, thirst and inflammation; cure skin diseases and leprosy (Ayurveda).

The juice of the leaves is an effectual insecticide and a valuable application in scabies, if rubbed well and frequently over the affected parts. The leaves are esteemed useful in cutaneous diseases.

Useful in chronic rheumatism and asthma.

The bark is a good sub-aromatic bitter (Graham).

Bengal: Bosanti, Madhavilata, Madubhi, Madubhlata—; *Burma:* Bimve—; *Canarese:* Adimurtte, Adirganti, Madhavi, Vasantaduti—; *Central Provinces:* Kampti—; *Dehra Dun:* Aneta—; *Garhwal:* Anetha—; *Gujarat:* Madhavi, Ragatpiti, Rakatpiti—; *Hindi:* Hutimukta, Kampti, Madhavilata, Madmalti, Madholota—; *La Reunion:* Liane fleur d'orange—; *Lepcha:* Tungchir-rik—; *Malayalam:* Sitampu—; *Marathi:* Haladvel, Madhavi, Madhavlata, Madhumalati—; *Mundari:* Gumdaba, Gurundaba, Gurundaeba, Gurundaenari, Gurundanari—; *Nepal:* Charpatelahara, Madhabilata, Shempati—; *North-Western Provinces:* Aitalugala—; *Porebunder:* Madhavi, Ragatpiti, Rakatpiti—; *Punjab:* Benkar, Chabuk, Chopar, Churi, Endra, Khumb—; *Ramnagar:* Anetha—; *Sanskrit:* Atimukta, Bhadralata, Bhramarotsava, Bhringapriya, Bhumimandapa, Bhushana, Chandravalli, Kamuka, Madhavi, Madhavilata, Malati, Mandapa, Parashraya, Pundrakalata, Sugandha, Suvasanta, Vasantaduti, Vasanti—; *Sinhalese:* Atimuktamu, Puwakgedi—; *Tamil:* Adigam, Adigandi, Adimattam, Karungodi, Kurindai, Kurinja, Kurungu, Kurukkatti, Madavi, Nagari, Sirugurindai, Vasandagalamalligai, Vasandi—; *Telugu:* Atimutamu, Kuruvenda, Madhavi tege, Potuvadla, Suragata, Vadlayerala, Vedala—; *Uriya:* Boromali, Boromolli, Gurundu, Losori, Madhobilota, Madhubilota, Maloti—; *Visayan:* Comimpol—.

ZYGOPHYLLACEAE.

Shrubs or herbs woody at the base, rarely trees; branches often jointed at the nodes. Leaves opposite or alternate, 2-foliolate or pinnate, rarely 3-foliolate, not gland-dotted; stipules paired, persistent, often spinescent. Flowers rarely blue, hermaphrodite, actinomorphic or zygomorphic. Sepals 5, rarely 4, free or rarely connate at the base, imbricate, rarely valvate. Petals 4-5, rarely absent, hypogynous, free, imbricate or contorted, rarely valvate. Disk mostly present. Stamens the same number as to triple the number of the petals, often unequal in length; filaments free, often with a scale inside; anthers 2-celled, opening lengthwise. Ovary superior, sessile or rarely stipitate, usually 4-5-celled, cells rarely transversely locellate; style simple, short, or stigmas sessile; ovules 2 or more in each cell, axile. Fruit various but never baccate. Seeds mostly with some endosperm; embryo as long as the seed, straight or slightly curved.—Genera 22. Species 160.—Xero-and halo- phytes of tropical and subtropical regions.

A. Seeds exalbuminous.
   Petals entire. Stamens 10. Fruit of usually spiny cocci. Leaves abruptly pinnate .... TRIBULUS.
B. Seeds albuminous.
   I. Petals 4-5, Stamens 8-10. Ovules axile, superposed. Leaves 1-2-foliate .... ZYGOPHYLLUM.
   II. Petals 5. Stamens 10. Ovules basal, colateral. Leaves 1-3-foliolate .... FAGONIA.

The bark and wood are considered sudorific; the leaves and the herbs are often acrid and used as astringents.

Guaiacic, guaiaconic, and guaiaretic acids have been isolated from GUAIACUM.

OFFICIAL:—*Guaiacum officinale* Linn. (Austria, Belgium, France, Germany, Italy, Japan, Norway, Portugal, Russia, Sweden, Switzerland).

Guaiacum sanctum Linn. (Belgium, Germany, Italy, Japan, Norway, Portugal, Russia, Switzerland).

TRIBULUS Tourn. ex Linn.

Branching prostrate herbs, often with silky hairs. Leaves stipulate, opposite (or sometimes alternate by suppression), usually

one of the pair smaller than the other, abruptly pinnate. Flowers solitary, pseudoaxillary, white or yellow. Sepals 5, imbricate. Petals 5, spreading, imbricate, fugacious. Disk annular, 10-lobed. Stamens 10 (rarely 5), inserted on the base of the disk, the longer opposite to the petals, the 5 shorter with a small gland outside; filaments filiform, naked. Ovary sessile, hirsute, 5-12-lobed, 5-12-celled; ovules 1-5 in each cell, superposed; style short, pyramidal or filiform; stigmas 5-12. Fruit 5-angled, of 5-12 winged or spinous or tuberculate indehiscent cocci. Seeds obliquely pendulous; testa membranous; embryo exalbuminous; cotyledons oval; radicle short. —Species 12.—Africa, Asia, America, Mediterranean.

1. Cocci with 2 long and 2 short spines .... 1. *T. terrestris.*
2. Cocci broadly winged .... 2. *T. alatus.*

The plant is commonly used as an astringent, also as a diuretic and aphrodisiac.

T. terrestris Linn. is used medicinally in Europe, Indo China, La Reunion, Southern Africa; *T. maximus* Linn. in the Gold Coast and the West Indies.

1. **Tribulus terrestris** Linn. Sp. Pl. (1753) 387.—PLATE 168.

A procumbent herb; stems and branches pilose; young parts silky-villous. Leaves opposite, abruptly pinnate, one of each pair usually smaller than the other, sometimes wanting; stipules lanceolate, hairy; leaflets 3-6 pairs, 6-12 mm. long, oblong, mucronate, sericeo-villous with appressed hairs beneath and more or less so on the upper surface, base rounded oblique; petiolules very short, pilose. Flowers axillary or leaf-opposed, solitary; pedicels 1.2-2 cm. long, slender, hairy. Sepals 6 mm. lanceolate, acute, hairy. Petals 1 cm. long, oblong-obovate; claw short, hairy. Ovary bristly; style short, stout; stigmatic lobes longer than the diameter of the style. Fruit globose, consisting of (usually) 5 hairy or nearly glabrous, often muriculate, woody cocci, each with 2 pairs of hard sharp spines, one pair longer than the other. Seeds several in each coccus, with transverse partitions between them.

Distribution: Throughout India up to 11,000 ft. in Kashmir, Ceylon.—All warm regions of both hemispheres.

The root and fruit are sweetish; cooling; tonic, fattening, aphrodisiac, alterative; improve appetite; useful in strangury, urinary discharges, vesicular calculi, pruritus ani; alleviate burning sensation; reduce inflammation; remove "tridosha," cough, asthma, pain; cure skin and heart diseases, piles, leprosy.— The leaves are aphrodisiac and purify the blood.— The seeds are cooling, fattening, diuretic aphrodisiac; remove inflammations, urinary troubles, stones in the bladder.—The ashes are sweet, cooling, aphrodisiac; cure "vata"; purify the blood (Ayurveda).

The fruit is sour with a bad taste; diuretic; removes gravel from the urine and stone in the bladder; cures strangury, gleet.—The leaves are diuretic, tonic; enrich the blood; increase the menstrual flow; cure gonorrhoea and gleet; a decoction is useful as a gargle for mouth troubles and painful gums; reduce inflammation.—The root is a good stomachic and appetiser; emmenagogue, diuretic carminative; cures lumbago (Yunani).

The fruits are regarded as cooling, diuretic, tonic and aphrodisiac, and are used in painful micturition, calculous affections, urinary disorders and impotence. An infusion made from the fruit has been found very useful as a diuretic in gout, kidney disease and gravel; also used largely in the Punjab as an aphrodisiac.

In Southern India, the fruit is highly valued as a diuretic. In many cases where this has been tried, the result was quite perceptible in the increase of the urinary secretion. There is a method of administration, in which the fruit and the root are boiled with rice to form a medicated water, which is taken in large quantities.

In Ormara the plant is reduced to a paste and mixed with water, the mixture is drunk as a tonic and cooling medicine. It is used as a remedy for gonorrhœa in Las Bela. The seeds, taken in milk, are used to cure debility at Loralai (Hughes-Butler).

In the South of France and in the Southern countries of Europe the roots and the leaves are considered tonic and aperient.

In China the fruit is reputed tonic and astringent. It is used for coughs, spermatorrhoea, scabies, anemia, ophthalmia; it is a powerful hemostatic, much used in postpartum haemorrhage and in dysenteries;

as a gargle it is prescribed for ulcers of the gums, inflammation of the mouth, aphthae, and angina.

In the provinces of Hou-Peh and Ho-Nan the seeds are considered tonic and aphrodisiac; they are prescribed in diseases of the bladder, more particularly in vesicular calculus.

In Indo China the seeds are considered astringent; they are used in epistaxis and other hemorrhages; as a gargle they are prescribed for ulcers and inflammations of the mouth.

It is a Suto rheumatism remedy in South Africa. The Chuanas use a cold infusion of the root for catarrh of the stomach and as a purgative in cattle.

In La Reunion the leaves are considered astringent and diuretic; the fruits aperient, galactagogue, and aphrodisiac.

In the Gold Coast it is used to cure whitlow.

The entire plant, but more particularly the fruits, are used in medicine. They possess cooling, diuretic, tonic, and aphrodisiac properties and are used in dysuria, urinary disorders, calculus affections, and impotency. It was given a good trial in Bright's disease with dropsy. All the patients derived much benefit by its use.— It was also used, combined with bdellium, in a patient suffering from gonorrhoeal rheumatism with cystitis. The patient recovered without interruption (Koman).

An extract prepared from the seeds was tried by us in a number of cases. The drug undoubtedly has diuretic properties, but showed no advantage over many of the diuretics in the British Pharmacopoeia. The diuretic properties no doubt are due to the large quantities of the nitrates present as well as the essential oil which occurs in the seeds. The claims put forward regarding its efficacy in other conditions above stated cannot be substantiated (Chopra and Ghosh).

Sushruta prescribes the root in combination with other drugs in the treatment of scorpion sting; but it is not an antidote to scorpion venom (Caius and Mhaskar).

The following substances are found in the fruit:—an alkaloid in traces (0.001 per cent); fixed oil 3.5 per cent consisting mainly of unsaturated acids; essential oil in very small quantities; resins; fair amounts of nitrates (Chopra and Ghosh).

The plant is the cause of *geeldikkop* (*dikgeel*) in small stock, a condition characterised by oedema of the head, fever, and jaundice (Watt and Breyer-Brandwijk).

Afghanistan: Krunda—; *Afrikaans:* Caltrop, Dubbeltjiedoring, Duiweltjies, Morester, Volstruisdoring—; *Annam:* Gai ma vuong, Gai sau, Tat le—; *Arabic:* Bastitaj, Busteyrumi, Khasak—; *Bengal:* Gokhru, Gokhuru—; Gokshura—; *Bombay:* Gokhru, Lahanagokru, Sarate—; *Bori:* Skarwandi—; *Burma:* Charatte, Suleanen—; *Canarese:* Negalu—; *Cape Peninsula:* Duiveltjes—; *Catalan:* Caixals de vella—; *Central Provinces:* Gokhru—; *Chinese:* Chi Li, Tsi Li Tse—; *Chuana:* Sekanama, Thsehlo—; *Deccan:* Ghokru, Kanteghokru—; *English:* Calthrops—; *French:* Croix de chevalier, Croix de Malte, Herbe terrestre, Herse terrestre, Saligot terrestre, Tribule commune, Tribule terrestre—; *Ga:* Gbelefor—; *Gujarat:* Betagokhru, Gokharu, Gokhru, Mithagokhru, Nahanagokhru—; *Hausa:* Timeglouss, Tsaido, Tsidau—; *Hindi:* Burragokhur, Chhotagokhru, Hatechanghara, Hussuk, Gokhru, Gokhuru, Gokshri—; *Indo China:* Qui kien sau, Tat le—; *Jaluo:* Okuro—; *Kachhi:* Sarang—; *Kavirondo:* Okuro—; *Ladak:* Kokullak, Rasha—; *Languedoc:* Epinar fer, Herso—; *La Reunion:* Pagode—; *Las Bela:* Gohind, Gohindwal—; *Loralai:* Skroundki—; *Malayalam:* Neringil, Nerinnil—; *Malta:* Land Caltrops, Caciarello, Tribolo, Ghatba, Salib l'art—; *Marathi:* Ghokaru, Lahanagokharu, Sharatte—; *Mauritania:* Tadress—; *Nasirabad:* Bhakhra—; *Ormara:* Khorbar, Tahkandi—; *Persian:* Kharekhasak, Khussuck—; *Punjab:* Bakhra, Bhakhra, Bhukri, Gokhrudesi, Lotak—; *Pushtu:* Kandalai, Malkundai—; *Sakalave:* Bakakely—; *Sanskrit:* Bahukantaka, Bhakshataka, Chanadruma, Gokantaka, Gokhura, Gokshura, Gokshuri, Ikshugandha, Kanta, Kantaphala, Kshudragokshura, Kshudrakshura, Kshura, Laghugokshura, Palankasha, Shadanga, Shvadanshtra, Sthalashringataka, Sudumstra, Trikantaka, Vanashringataka—; *Sind:* Gokhru, Trikundri—; *Sinhalese:* Neranchi, Neranji, Sembunerinchi—; *Sokoto:* Tsaida—; *South Africa:* Devil's Thorn—; *Spanish:* Abrojos—; *Suto:* Thsehlo—; *Swahili:* Mbigiri—; *Tamil:* Nerunji, Sirunerinji—; *Telugu:*

Chirupalleru, Palleru—; *Urdu:* Gokharu—; *Uriya:* Gakhura, Gokshra—.

2. **Tribulus alatus** Del. Fl. Aegypt. Ill. (1812) 62.—PLATE 169.

Annual; branches procumbent or ascending, densely silky-villous. Leaves as in the former species; stipules broadly ovate, acute, hairy. Flowers 8-12 mm. diam. Sepals 4.5 mm. long, ovate, acuminate, villous outside. Petals very thin, scarcely longer than the sepals, cuneate-oblong, the apex sometimes slightly dentate. Stamens 5 (or ? 10). Ovary bristly with long white hairs; style short, stout. Fruit of 5, 2-seeded, cocci, the cocci very hirsute, the spines confluent into toothed wings.

Distribution: Sind, Cutch, Desert of W. Rajputana, Baluchistan.—Persian Baluchistan, Arabia, Syria, Egypt.

The fruit is a good appetiser; good emmenagogue; cures inflammation; useful in uterine complaints (Ayurveda).

The fruits are used for the same purposes at those of *T. terrestris.*

In Baluchistan, the fruit is a domestic remedy for uterine disorders after parturition.

Hindi: Gokhurikalan, Nindotrikund—; *Kharan:* Sarenk—; *Punjab:* Bakhra, Gokhrudesi, Hasak, Lotak—; *Pushtu:* Kurkundai—; *Sind:* Latak, Nindotrikund, Trikundri—; *Urdu:* Bakhra—.

ZYGOPHYLLUM Linn.

Small shrubs or prostrate herbs; branches terete, often spinescent. Leaves opposite, 1-2-foliolate; leaflets usually fleshy; stipules 2, often spiny. Flowers from among the stipules, white or yellow, usually marked with a red or purple spot at the base. Calyx 4-5-partite, persistent or deciduous, imbricate. Petals 4-5, clawed, imbricate and contorted. Disk fleshy, angular, cup-shaped or concave. Stamens 8-10, inserted at the base of the disk, longer than the petals; filaments filiform, with a scale at the base within; anthers oblong. Ovary sessile on the disk, 4-5-gonous, 4-5- (rarely 2-3-) celled, attenuated into an angled style; stigma minute; ovules 2-many in

each cell, superposed; raphe free or adnate. Fruit capsular, 4-5-gonous or 4-5-winged, indehiscent or septicidally dehiscent into 5 cocci, or loculicidally 5-valved, the endocarp sometimes separating. Seeds 1 or more in each cell, pendulous; testa crustaceous; albumen scanty; cotyledons oblong.—Species 60.—Tropics of the Old World, desert and steppes.

1. Leaves simple, cylindric .... 1. *Z. simplex.*
2. Leaves 2-foliolate .... 2. *Z. coccineum.*

The seeds are considered anthelmintic.

The following are used medicinally:—in Southern Russia—*Z. fabago* Linn.—; in Asia Minor and Afghanistan—*Z. fabago* Linn.—; in Arabia—*Z. coccineum* Linn., *Z. simplex* Linn.—; in Egypt and South Africa— *Z. sessilifolium* Linn.—; in South America—*Z. arboreum* Linn.—.

1. **Zygophyllum simplex** Linn. Mant. I (1767) 68.—PLATE 170A.

A succulent watery much-branched procumbent herb; branches slender, reddish, striate, glabrous. Leaves small, subsessile, cylindric, oblong or obovate, obtuse, fleshy; stipules lanceolate, acute. Flowers small. Sepals obovate, cucullate at the apex. Petals yellow, spathulate, spreading, margins flat. Staminal scale bipartite, hyaline, the segments obovate. Ovary turbinate, glabrous, ribbed; style tapering. Capsules deflexed, rugulose, separating into 5 compressed 3-5-seeded cocci. Seeds minute, oblong, attenuated at both ends, smooth.

Distribution: Rajputana Desert, Cutch, Sind, Baluchistan.—Arabia, Palestine, Egypt, Mediterranean, Somaliland, Cape Verde Islands, S. and S.-W. Africa.

The Arabs beat up the leaves or the seeds in water and apply the infusion to the eyes in ophthalmia and leucoma. They also consider the seeds anthelmintic.

Ormara: Chippal—; *Punjab:* Alethi—; *Sind:* Alethi, Putlani—.

2. **Zygophyllum coccineum** Linn. Sp. Pl. (1753) 386.

Suffruticose; branches woody, striate and papillose, hoary at first with a white powdery tomentum, at length glabrous. Leaves

2-foliolate, powdery; petioles stout, fleshy, grooved, longer than the leaflets; stipules triangular, scarious; leaflets oblong, cylindric or semicylindric, obtuse, minutely powdery. Flowers solitary, white or tinged with yellow. Sepals fleshy, cucullate, the margins membranous. Petals spathulate, spreading, longer than the sepals, undulate on the margin. Staminal scale ovate-lanceolate, entire or lacerate at the apex. Ovary glabrous or velvety. Capsules 1 cm. long, oblong or obovoid, 5-ribbed, truncate at the base and the apex; cocci 3-5-seeded. Seeds small, ovoid, acute, tubercled, compressed.

Distribution: Sind, Baluchistan.—Arabia, Syria, Egypt, Canaries, Nubia, Somaliland.

The seeds are reputed anthelmintic among the Arabs.

FAGONIA Tourn. ex Linn.

Branching herbs woody at the base, erect or prostrate. Leaves opposite, 1-3-foliolate, the leaflets quite entire, mucronate; stipules often spiny. Flowers solitary from among the stipules, rosy or violet, rarely yellow. Sepals 5, deciduous, imbricate. Petals 5, clawed, caducous, imbricate. Disk short, inconspicuous. Stamens 10, inserted on the disk; filaments filiform, naked; anthers shortly oblong. Ovary sessile, 5-gonous, 5-celled, narrowed into a 5-gonous subulate style; ovules 2, near the base of the cell, collateral, pendulous from ascending funicles; stigma simple. Fruit 5-gonous, of 5, 1-seeded, cocci which dehisce along the ventral suture and separate from a horny endocarp. Seeds erect, compressed, broadly oblong; testa mucilaginous; albumen horny; cotyledons broad, flat, ovate.—Species 20.—Mediterranean to India, S. Africa, California, Chili.

Therapeutically the genus has little importance.

1. **Fagonia cretica** Linn. Sp. Pl. (1753) 386.—*F. arabica* Linn. l. c.—*F. Bruguieri* DC. Prodr. I (1824) 704.—*F. Mysorensis* Roth. Nov. Sp. 215.—*F. cretica* var. *arabica* T. Anders. in Journ. Linn. Soc. V, Suppl. I, 12.—PLATE 170B (under *F. Bruguieri* DC.) and PLATE 171 (under *F. arabica* Linn.).

A small spiny undershrub with stiff branches often more or less prostrate. Twigs slender, terete, striate, glabrous, glandular. Leaves opposite, 1-3-foliate, about 12 by 2.5 mm., entire, linear or elliptic, mucronate; petiole very variable, 0-3 cm. long, sometimes

leaflike; stipules transformed into sharp slender spines up to 1.2 cm. long, persistent and continuing growth long after the fall of the leaves. Flowers solitary, rose-coloured, on peduncles 5-12 mm. long, arising from between the stipules. Sepals 5, deciduous, imbricate, half as long as the petals. Petals 6 mm. long, spathulate with a marked claw. Disk short, inconspicuous. Stamens 10, inserted on the disk; filaments filiform, naked; anthers oblong. Ovary hairy, sessile, 5-angled, 5-celled, tapering into a 5-angled style; stigma simple. Fruit 5 mm. long, of 5 1-seeded cocci, glandular-pubescent, deeply 5-partite almost to the axis; cocci dehiscing along the ventral suture and separating from a horny endocarp.

Distribution: Deccan, W. Khandesh, Cutch, Sind, Baluchistan, Waziristan, W. Rajputana, Upper Gangetic Plain, Punjab, westward to Afghanistan.—Persia, Arabia and Mediterranean.

The plant is acrid and bitter; cooling; removes "vata," asthma, fever, thirst, vomiting; cures fevers, dysentery, urinary discharges, erysipelas, typhoid; alexipharmac; reduces tumours; purifies the blood (Ayurveda).

The plant is acrid and bitter; cooling; removes "vata", asthma, emmenagogue; good for liver trouble, in chronic bronchitis, spitting of blood, ophthalmia, toothache, stomatitis.— The bark is used in scabies.— The leaves are cooling; useful in fevers, thirst, vomiting, boils, leucoderma, biliousness (Yunani).

Sushruta prescribes the leaves and twigs in combination with other drugs for the treatment of snake-bite.

The plant is useful as an application to tumors, also in chronic fever, dropsy, and delirium and in any disorder which arises from poisoning.

It has a great reputation as a suppurative in cases of abscesses from thorns, etc. It is also used for cooling the mouth in stomatitis; the juice being boiled with sugar-candy until quite thick, and a small quantity allowed to dissolve in the mouth frequently. The juice is thought to prevent suppuration when applied to open wounds.

It is largely used by the native practitioners as a bitter and astringent tonic.

It is used in Sind and Afghanistan as a popular remedy for fever among the hill people.

The plant is given as a tonic and febrifuge, and in the Peshawar Valley it is given to children as a prophylactic against small-pox (Bellew).

The leaves and twigs are supposed to possess cooling properties.

In the Ormara hills the plant is pounded and bound upon the swellings of the neck and for scrofula. At Saruna in Jhalawan it is pounded in water and strained; the liquid is rubbed all over the bodies of children when they get fever. In Kharan an infusion made with hot water is used as a bath in cases of fever. The plant is considered a cure for itch in the Las Bela State; and in the Levy tracts it is for that purpose pounded, mixed with milk, kept for three days, and then rubbed all over the body (Hughes-Buller).

The leaves and twigs are not an antidote to snake-venom (Mhaskar and Caius).

Ajmere: Jowasa—; *Arabic:* Shaukubaitiza—; *Cutch:* Dhraman—; *French:* Fagone—; *Gujarat:* Dhamaso—; *Hindi:* Damahan, Hinguna, Ustarkhar, Usturgar—; *Jhalawan:* Karkawa—; *Kharan:* Karkawah—; *Las Bela:* Dama, Damatro, Dhramao, Kandiro, Karkawah—; *Marathi:* Dhamasa, Dumaso—; *Ormara:* Shurdo—; *Persian:* Badavard—; *Punjab:* Dama, Damiya, Dhama, Dhamanh, Dramah, Samaba—; *Sanskrit:* Ajabhakshya, Ananto, Atmamuli, Dhanuryasa, Dhanvayasa, Dhanvi, Durabhigraha, Duralabha, Dusparsha, Gandhari, Grahini, Idankarya, Kachhura, Kashaya, Kunashaka, Marujauma, Mriduparna, Padmamukhi, Phanihari, Prabodhani, Pralhadini, Rodini, Samudranta, Sukshmadala, Tamramula, Ushtrabhakshya, Vikanta, Virupa, Visharada—; *Sind:* Dama, Damiya, Dhama, Dhamanh, Dramah, Drammaho, Drummahu—; *Telugu:* Chittigara—; *Trans-Indus:* Aghzai, Spalaghzai—; *Urdu:* Badavard—.

GERANIACEAE.

Annual herbs or undershrubs, rarely arborescent. Leaves alternate or opposite, mostly lobate, dissected or compound; stipules often paired. Flowers often handsome, hermaphrodite, actinomorphic or slightly zygomorphic, axillary, solitary to subumbellate. Sepals persistent, 4-5, free or connate to the middle, imbricate or rarely valvate, the dorsal one sometimes spurred. Petals 5, rarely 4, very rarely absent, hypogynous or subperigynous, imbricate, rarely contorted. Stamens 2-3 times the number of the sepals, sometimes a few without anthers; filaments mostly more or less connate at the base; anthers 2-celled, opening lengthwise. Ovary 3-5-lobed; ovules 1-2 in each cell, superposed, pendulous, rarely more than 2. Fruit lobed, lobes 1-seeded, rarely more-seeded, often beaked. Seeds pendulous, with thin or no (rarely copious) endosperm and mostly curved embryo.—Genera 11. Species 650.—Cosmopolitan.

The roots are astringent, and the herbaceous parts more or less stimulant.

The Monsonias and one or two species of Pelargonium have a wide reputation in South Africa as remedies in dysentery.

Tannin, glucosides—glucotropaeolin, pelargonin—, and milk-coagulating enzymes have been isolated from some of the members. Geraniol and citronellol are among the products isolated from the essential oils.

Official:—*Pelargonium spp.* (Belgium).

Geranium (Tourn.) Linn.

Erect, diffuse or procumbent herbs; joints swollen. Leaves opposite, stalked, orbicular and palmately lobed or of triangular outline and divided to the base into 3 or 5 pinnatifid segments. Flowers 2-sexual, regular, in pairs on axillary stalks. Sepals 5, free, ending in a short pointed tip. Petals 5, free, clawed, alternate with 5 glands. Stamens 10, all anther-bearing, 5 longer alternate with 5 shorter; filaments flattened, united at the base. Receptacle prolonged upwards in a persistent, 5-grooved, tapering column.

Ovary of 5 nearly distinct, 1-celled carpels, whorled round and adnate to the base of the column. Styles 5, adnate to the column; stigmas terminal, simple, linear, ultimately diverging. As the fruit develops, the column and styles elongate; when ripe the carpels and the lower part of the styles separate from the column, the styles coiling upwards with a jerk and ejecting the seeds; style glabrous on the inner surface. After the seeds have been scattered, the persistent calyx, the column, and the curled up styles carrying the empty carpels, somewhat resemble a minature chandelier. Seeds, one in each carpel, small smooth.—Species 300.—Cosmopolitan, especially temperate.

A. Flowers large, 2.5 cm. and more in diam.
- I. Leaves 3-5-lobed. Flowers blue-purple to red-purple .... 1. *G. wallichianum.*
- II. Leaves 7-9-lobed. Flowers bluish purple .... 7. *G. pratense.*

B. Flowers less than 2.5 cm. diam.
- I. Flower-stalks 2-flowered, solitary in the axils of leaves or at end of branches. Flower-buds oblong or ovate, not pyramidal
  - a. Petals entire .... 2. *G. nepalense.*
  - b. Petals notched .... 10. *G. sibiricum.*
- II. Flower-stalks 2- or more flowered, crowded. Flower-bud oblong or ovate, not pyramidal
  - Fruiting stalks bent down
    - 1. Carpels not wrinkled.
      - *Seeds smooth .... 8. *G. pusillum.*
      - **Seeds deeply pitted .... 9. *G. rotundifolium.*
    - 2. Carpels wrinkled .... 6. *G. molle.*
- III. Flower-stalks 2-flowered. Flower-buds pyramidal
  - a. Flowers streaked with dark and light red .... 3. *G. robertianum.*
  - b. Flowers rose-red .... 5. *G. lucidum.*
  - c. Flowers rose-coloured with a dark purple eye ...... 4. *G. ocellatum.*

The genus is noted for its astringent properties.

The following are used medicinally in Europe—*G. argenteum* Linn., *G. bohemicum* Linn., *G. columbinum* Linn., *G. dessectum* Linn., *G. divaricatum* Ehrh., *G. lucidum* Linn., *G. molle* Linn., *G. nodosum* Linn., *G. palustre* Linn., *G. phaeum* Linn., *G. pratense* Linn., *G. pusillum* Birm., *G. pyrenaicum* Linn., *G. rivulare* Vill., *G. robertianum* Linn., *G. rotundifolium* Linn., *G. sanguineum* Linn., *G. sibiricum* Linn., *G. sylvaticum* Linn., *G. macrorrhizum* Linn.—; in North America—*G. maculatum* Linn.—; in Southern Africa—*G. canescens* L'Herit., *G. incanum* Linn., *G. ornithopodum* E. & Z.—.

1. **Geranium wallichianum** Sw. Geran. I (1820-22) t. 90; Coventry Wild Fl. Kashmir (1923) 29, pl. XV.; Blatter Beautiful Fl. Kashmir I (1927) 65, pl. 16, f. 1.—PLATE 172.

Perennial, hairy; rootstock thick. Stems robust, 0.3-12 m., erect. Leaves orbicular, 5-12.5 cm. across, palmately 3-5-lobed; segments wedge-shaped, pointed, acutely and irregularly toothed; stipules oblong-ovate, 1.2-2.5 cm. Flowers blue-purple, 3.8-5 cm. diam. Sepals abruptly long-pointed. Petals slightly notched, claw hairy.

Distribution: Kuram Valley, Kashmir, Simla, Kumaon, Korea.

The herb possesses the astringent properties of the genus to a marked degree.

Duthie states, that in the village of Jumnotri it is employed as a cure for toothache.

Kashmir: Kaoashud—; *North-Western Provinces:* Liljahri—; *Pushtu:* Mamiran—.

2. **Geranium nepalense** Sw. Geran. I (1820-22) t. 12; Don Prodr. Fl. Nep. (1825) 208.—*G. affine* Wight & Arn. Prodr. (1834) 133 (non Ledeb.); Wight Ill. I (1831) 153, t. 59.—PLATE 173.

Perennial, pubescent or softly hairy. Stems prostrate, diffuse, 15-45 cm., branches rooting at the joints. Leaves orbicular, 3.8-7.5 cm., across, palmately 3-5-lobed; segments equal or nearly so, irregularly lobed and toothed; stipules narrowly lanceolate, 1.2 cm. Flowers pale purple, 8-16 mm. diam. Sepals acute, shortly pointed. Petals slightly notched.

Distribution: All over the temperate Himalaya, 5,000—9,000 ft., Kuram Valley, Kashmir, Garhwal, Nepal, Sikkim, Khasia Hills, Manipur, Nilgiris, Pulney Hills, Ceylon. —China, Japan.

The plant is used in the Punjab as an astringent, and in certain renal diseases.

Chinese: Mang Miao, Mang Niu—; *Hindi* and *Punjab:* Bhand, Bhanda—.

3. **Geranium robertianum** Linn. Sp. Pl. (1753) 681.—PLATE 174.

Annual or biennial, softly hairy, usually glandular and strongly

scented, often turning red. Stems erect, 30-60 cm. Leaves triangular, 2.5-7.5 cm. broad, divided to the base in 3-5 pinnately-lobed segments, central segment longest, lobes acute; stipules lanceolate, 6 mm. Flowers red-pink, streaked with white, 1.2 cm. diam. Sepals acute, long-awned. Petals entire.

Distribution: W. temperate Himalaya, 6,000—8,000 ft., from Kashmir to Garhwal.—Siberia, Caucasus, Asia Minor, Europe, N. Africa.

The herb possesses slightly astringent properties.

It was formerly much used in European medicine. It has a disagreeable, bitterish, astringent taste, and imparts its virtues to boiling water. It was employed internally in intermittent fever, consumption, nephritic complaints, jaundice, and as a gargle in affections of the throat, and externally as a resolvent to swollen breasts and other tumours.

It is still a popular remedy in Wales in nephritic complaints.

Catalan: Agullas, Gerani pudent—; *Dutch:* Robbrechtskruid, Robertskruid, Roode Ojevaarsbek—; *English:* Bird's-eye, Bloodwort, Soldiers' Buttons, Cuckoo-meat, Cuckoo's Eyes, Cuckoo's Victuals, Death-come-quickly, Dog's Toes, Dragon's Blood, Fellow Grass, Fellow-wort, Fetid Crane's Bill, Fox Grass, Garden Gate, Fox, Herb Robert, Jenny Wren, Kiss Me, Knife and Fork, London Pink, Ragged Robin, Redbreasts, Red Shank, Redweed, Robert Robin, Robin Flower, Robin Hood, Robin-i'-th'-Hedge, Robin Redbreast, Robin Redshanks, Robin's Eye, Sailor's Knot, Scotch Geranium, Stinking Bob, Stock Bill, Stork's Bill, Wild Geranium, Wild Pink, Wren's Flowers—; *French:* Bec de cigogne, Bec de grue, Bec de héron, Bec de pigeon, Bec de Robert, Cou de cigogne, Geranion, Géranion ă Robert, Geraine robertin, Herbe ă l'esquinancie, Herbe ă Robert, Patte d'alouette, Persil marsigouin, Pied de colombe, Pied de pigeon, Robertin—; *German:* Bocksstorchschnabel, Katharinenkraut, Krempelkraut, Robertskraut, Rotlaufkraut, Ruprechtskraut, Sankt Katharinenkraut, Stinkeuder Storchschnabel, Storchschnabel, Taubenfuss, Warzenkraut—; *Greek:* Giranion—; *Italian:* Cicuta rossa, Erba comicina, Geranio, Geranio roberziano—; *Spanish:* Gerania, Pica de grulla, Yerba de la esquinancia, Yerba de San Roberto—.

4. **Geranium ocellatum** Camb. in Jacq. Voy. Bot. (1841-44) 33, t. 38, var. *himalaicum* R. Knuth in Engl. Pflanzenr. IV, 129 (1912) 62.—PLATE 175.

Annual, hoary pubescent. Stems prostrate or diffuse, 30-45 cm. Leaves orbicular, 1.2-5 cm. across, palmately 5-7-lobed; segments 3-lobed, toothed. Petals pink, with dark purple base, forming an almost black spot in the centre of the flower. Sepals acute, minutely awned. Petals broad, entire.

Distribution: Hilly districts of N. India, from the Salt Range and Kashmir to Nepal, Bihar, Manipur.

The plant possesses diuretic and astringent properties.

Hindi and *Punjabi:* Bhanda—.

5. **Geranium lucidum** Linn. Sp. Pl. 682.

Annual, nearly glabrous, often turning bright red. Stems slender, erect or diffuse, 15-30 cm. Leaves shining, orbicular 2.5-5 cm. across, palmately 5-7-lobed; segments bluntly toothed; stipules acute, 5 mm. Flowers pink, hardly 8 mm. diam. Calyx 5-angled, sepals erect, acute, minutely pointed, tips converging. Petals entire.

Distribution: W. Himalaya, 6,000—9,000 ft.—N. Asia, N. Africa, Europe.

The plant is diuretic and astringent.

English: Shining Crane's Bill—.

6. **Geranium molle** Linn. Sp. Pl. (1753) 682.

A herb 15-30 cm. high, softly downy, glandular above. Stems rather stout, spreading. Leaves rotund to reniform with 7-9 lobes which are contiguous, cuneate, deep, scalloped, trifid at the tip. Radical leaves long-stalked. Stipules ovate. Flowers small, purple or white, with lilac claws, fringed with hairs, obcordate, longer than the sepals. Sepals blunt-pointed. Flower-stalks in the axils of leaves. Filaments smooth. Carpels persistent, transversely wrinkled, keeled, smooth. Seeds smooth.

Distribution: Kishtwar, Kumaon.—Westwards to Europe and N. Africa.

In Spain, the plant is considered anodyne, astringent and vulnerary.

English: Dove's Foot—.

7. **Geranium pratense** Linn. Sp. Pl. (1753) 681.

Stem 0.6-1.2 m. high, erect, stout, branched, hairs spreading. Leaves stalked, 5-7.5 cm. diam., rounded, 7-9-parted, segments sharply cut. Stipules subulate to lanceolate. Flower-stalks 2-flowered, bent back in fruit. Flowers large, 2.5-5 cm. diam., bluish purple, veined. Petals long, spreading, obovate, entire or notched, claw or stalk fringed with hairs, or bearded. Sepals long aristate, spreading. Filaments slender, cuneate below, hairless or hairy at the base. Carpels smooth, glandular to hairy, the hairs spreading. Seeds minutely netted.

The flowers vary considerably in colour from almost red to blue.

Distribution: Europe, N. Asia, W. temperate Himalaya.

The plant is used as a vulnerary in Europe.

English: Crane's-bill, Crowfoot, Meadow Crane's-bill, Grace of God, Gratia Dei—; *French:* Grace-Dieu des Allemands—; *German:* Wiesenstorchschnabel—.

8. **Geranium pusillum** Burm. f. Spec. Geran. 27.

A prostrate, then erect herb, or with a semirosette habit. Stem spreading, much-branched, leafy, downy, the down soft and short. Leaves 1.3-2.5 cm. diam., reniform to rotund, with 5-9 lobes radiating from a common centre, each lobe divided into 3. Stipules short. Flowers 6 mm. diam., blue-purple or pale rose, numerous; flower-stalks in the axils shorter than the leaves. Sepals blunt or pointed. Petals obcordate, scarcely exceeding the sepals, the claw fringed with hairs. Perfect stamens often only 5. Style pale flesh colour. Fruit 8 mm. long. Carpels not wrinkled, hairy.

Distribution: Europe, Syria, W. temperate Himalaya.

The plant is used in Europe as an anodyne, astringent, and vulnerary.

English: Small Crane's Bill—.

9. **Geranium rotundifolium** Linn. Sp. Pl. (1753) 683.

Erect or spreading, very slender, loosely hairy. Leaves 1.3-3.8 cm. diam., reniform, 7-lobed, segments broad, bluntly lobed. Flowers 8 mm. diam. Sepals with a short awn. Petals longer than the sepals,

entire, narrow, spathulate, pale pink, claw smooth. Fruit 16 mm. long; carpels keeled, not wrinkled. Seeds dotted.

Distribution: Punjab, W. temperate Himalaya, from Kashmir to Garhwal.—Europe, N. Africa, Siberia.

The plant is diuretic and astringent.

English: Round-leaved Crane's Bill—; *Italian:* Crisettina salvatica—.

10. **Geranium sibiricum** Linn. Sp. Pl. (1753) 683.

A prostrate, slender, much-branched, hoary herb. Leaves 5-gonal, 5-parted; segments rhomboid, pointed, sharply incised; upper leaves all stalked. Stipules subulate. Flower-stalks slender, 1-2-flowered. Sepals with a long awn, as long as or longer than the petals. Petals notched.

Distribution: Kashmir.—Siberia, Dahuria, Caucasus.

The plant is astringent, diuretic, and vulnerary.

OXALIDACEAE.

Herbaceus or suffrutescent, rarely arborescent. Leaves alternate, digitately or pinnately compound, sometimes simple by suppression of the leaflets; leaflets spirally coiled when young, usually closing at night; stipules absent. Flowers hermaphrodite, actinomorphic, sometimes of 2 kinds, some perfect and others minute and apetalous, solitary or subumbellate, rarely racemose or cymose. Calyx 5- fid or partite imbricate. Petals 5, shortly clawed, free or shortly connate at the base, contorted. Stamens 10, hypogynous, connate at the base, sometimes 5 without anthers; anthers 2-celled, opening lengthwise. Ovary 5-celled, superior; styles 5, free, persistent; stigmas capitate or shortly divided; ovules 1 or more, axile. Fruit mostly a capsule; seeds often with an elastic testa; endosperm fleshy, copious; embryo straight.—Genera 7. Species about 880.—Mostly tropical and subtropical.

A. Herbs. Fruit capsular.
   I. Stamens 10. Capsule loculicidal. Valves cohering with the axis. Leaves 3- ∞ -foliate .... OXALIS.
   II. Stamens 10. Capsule loculicidal. Valves usually separating from the axis to the base. Leaves pinnate .... BIOPHYTUM.
B. Trees or shrubs. Fruit berried. Stamens 10 or 5 and 5 staminodes. Ovules many. Leaves pinnate .... AVERRHOA.

In general, they have cooling, antibilious, and antiseptic properties.

Many of them contain potassium acid oxalate.

OXALIS Linn.

Acid herbs, rarely shrubby. Leaves radical or cauline, alternate, digitately or pinnately 3-foliolate. Flowers on axillary 1- or more- flowered peduncles, regular, yellow, rosy or white. Sepals 5, imbricate. Petals 5, hypogynous, contorted. Disk without glands. Stamens 10, free or united at the base, all antheriferous. Ovary 5-lobed, 5-celled; ovules 1-many in each cell; styles 5, distinct; stigmas terminal, capitate, 2-fid or laciniate. Capsule dehiscing loculicidally; valves persistent to the axis. Seeds with an outer fleshy coat bursting elastically; testa crustaceous; albumen fleshy; embryo straight.—Species 790.—Cosmopolitan, chiefly S. Africa and America.

1. Flowers yellow .... 1. *O. corniculata.*
2. Flowers white .... 2. *O. acetosella.*

The leaves are considered cooling and stomachic.

The following are used medicinally:— in Europe—*O. acetosella* Linn., *O. cernua* Thunb., *O. corniculata* Linn.—; in Indo China—*O. acetosella* Linn., *O. corniculata* Linn.—; in China—*O. corniculata* Linn.—; in the Philippine Islands—*O. acetosella* Linn., *O. corniculata* Linn.—; in North America—*O. acetosella* Linn., *O. corniculata* Linn.—; in Chile—*O. tuberosa* Molina—; in Peru—*O. crassicaulis* Zucc., *O. crenata* Jacq.—; in Brazil—*O. barrelieri* Linn., *O. carbosa* Molina, *O. cordata* St. Hil., *O. corniculata* Linn., *O. corymbosa* DC., *O. crassicaulis* Zucc., *O. hirsutissima* Zucc., *O. tuberosa* Molina—; in South Africa—*O. cernua* (Thunb.) Linn., *O. corniculata* Linn., *O. purpurata* Jacq., *O. semiloba* Sond., *O. smithii* Sond.—; in La Reunion—*O. corniculata* Linn.—.

1. **Oxalis corniculata** Linn. Sp. Pl. (1753) 435.—PLATE 176B.

A small procumbent herb; stems rooting, pubescent with appressed hairs. Leaves palmately 3-foliolate; petioles 3.8-9 cm. long, very slender, pubescent; stipules small, oblong, adnate to the petiole; leaflets 1.2-2.5 cm. long, obcordate, cuneate at the base, subsessile, glabrous or with a few appressed hairs and with ciliate margins. Flowers axillary, subumbellate; peduncles solitary, up to 9 cm. long, deflexed in fruit, pubescent; bracts beneath the pedicels lanceolate, hairy. Sepals 3-4.5 mm. long, oblong, obtuse, appressedly hairy outside. Petals yellow, oblong, rounded at the apex, emarginate, twice as long as the sepals. Stimga papillose. Capsules 2 cm. long, linear-oblong, 5-angled, shortly beaked, tomentose. Seeds numerous, broadly ovoid, acute, transversely striate, brown.

Distribution: Nearly all regions throughout the warmer parts of India and Ceylon, in the Himalayas up to 8,000 ft.—Cosmopolitan.

The herb is hot and bitter; easy to digest and a good appetiser; removes "kapha", "vata", and piles; astringent, cures dysentery and diarrhœas; cures skin diseases and quartan fevers (Ayurveda).

An infusion of the small leaves is given as a cooling medicine in fevers. It is used externally to remove warts and opacities of the cornea.

The fresh leaves made into a curry are said to improve the appetite and digestion of dyspeptic patients. Bruised with or without water, they are formed into a poultice and applied over inflamed parts, by which means, great cold is produced, and pain and other symptoms are relieved. Prepared with hot water, the leaves make a very efficient poultice for boils. The leaves are refrigerant and anti-scorbutic.

In the Konkan, the plant is rubbed down with water, boiled, and the juice of white onions added; this mixture is applied to the head in bilious headache.

Throught the East the whole plant is famous as a cure for scurvy.

In the Philippine Islands, a decoction of the leaves is prescribed in fevers and in dysentery.

In La Renuion the plant is considered diuretic, refrigerant, and astringent. In angina the leaves are applied to the next as a poultice and the decoction is used as a gargle.

The Sutos of South Africa use the plant in making a lotion for washing snake-bites.

In slight forms of chronic dysentery, the leaves boiled in butter milk and given twice or thrice a day prove very useful (Koman).

Arabic: Hemda, Hememdab, Homadmad—; *Assam:* Chengeri-tenga—; *Bengal:* Amrul, Amrulsak, Chalmori, Chukatripati, Omloti, Umulbet—; *Bombay:* Ambuti, Bhinsarpati, Nalkardaambuti—; *Canarese:* Pullampurachisappu—; *Chinese:* Souan Mi Ts'ao, Souan Oui Ts'ao, Tso Chiang Ts'ao—; *Deccan:* Amboti, Ambuti—; *English:* Indian Sorrel, Yellow Oxalis—; *French:* Pied de pigeon—; *Hindi:* Amrul, Amrulsak, Anboti, Chalmori, Chukatripati, Seh—; *Hova:* Kidiadiamborona, Kodiadiamborona, Kodiadiavorona—; *Indo China:* Chua me, Chua me ba chia, Som ten kalm, Tac tuong thao—; *Kumaon:* Amrul, Chalmori—; *La Reunion:* Petit trefle—; *Malayalam:* Poliyarala—; *Marathi:* Ambuti, Bhinsarpati—; *Mundari:* Husukiara, Jojoara, Piricatomara, Pirijojoara, Pusiganjuara, Pusi-kataara—; *New Caledonia:* Poulisiak ho—; *North-Western Provinces:* Ambuti, Amlika, Amrul—; *Pampangan:* Congi, Malamalugbugdagis, Yayo—; *Philippines:* Tainangdaga—; *Punjab:* Amlika, Amrul, Chukha, Khattamitha, Surchi, Travuke—; *Sanskrit:* Ambashta, Amlalonika, Amlika, Amlotaja, Changeri, Chukrita, Shuklika—; *Santal:* Tandichatomarak—; *Sinhalese:* Hinembulembiliya—; *Spanish:* Vinagrera de Cuba—; *Suto:* Bodila-ba-thaba—; *Tagalog:* Susocayohi, Taigandoga—; *Tamil:* Paliakiri, Puliyarai—; *Telugu:* Ambotikura, Pallachinta, Pulichinta, Pullachanchali—.

2. **Oxalis acetosella** Linn. Sp. Pl. (1753) 433, Blatter Beautiful Fl. Kashmir I (1927) 70, pl. 16, f. 6.—PLATE 176A.

A small delicate perennial herb 5-15 cm. high, stemless but with a longer or shorter horizontally creeping reddish knotty scaly rhizome. Leaves radical, numerous, stipulate, 3-foliolate with enlongated 5-15 cm. long petioles; petioles somewhat thickened and often purple at base, higher up light green and grooved; leaflets broadly obcordate,

light green with frequently a tinge of purple beneath, hairy and showing marked nyctytropic movement; stipules large, broad and membranous. Flowers solitary, 1-1.8 cm. diam., on elongated slender peduncles; peduncles longer than petioles, axillary, furnished with 2 scaly opposite bracteoles above the middle. Calyx gamosepalous, deeply divided; sepals 5, small, 4 mm. long, 2 mm. broad, oblong or ovate. Petals 5, inserted by a short claw and cohering above it, obovate blunt, white or pale rose veined with purple, yellowish at base, 4 times the length of the sepals. Stamens 10 in 2 whorls, the 5 exterior shorter, 3/4 length of the longer which are 4 mm. long. Ovary ovoid, 5-angled, erect, glabrous; cells 2-3 seeded, styles 5, slender, a little longer than the stamen; stigmas blunt.

Distribution: Temperate Himalaya from Kashmir to Sikkim, 8,000—12,000 ft.—Almost the whole N. temperate zone, excepting Pacific N. America.

This plant is a refrigerant; taken as a salad it forms a good anti-scorbutic; infused in milk to form whey, or in water, it forms a graceful drink in fevers and inflammatory cases.

In England an anti-putrescent gargle is concocted against quinsy with the leaves and petals of Wood Sorrel.

Catalan: Agrelleta, Lujula, Pa de Cucut—; *Danish:* Skovsyrer—; *Dutch:* Klaverzuuring, Zuurklaver—; *English:* Alleluia, Allolida, Bird's Bread-and-Cheese, Bird's Clover, Bread-and-Cheese, Cuckoo's Bread-and-Cheese, Cuckoo's Clover, Cuckoo-flower, Cuckoo-spice, Cuckoo's Victuals, French Sorrel, God A'mighty's Bread and Cheese, Gowk's Clover, Gowk Meat, Green Sauce, Hallelujah, Hare's Meat, Hearts, Lady's Cakes, Lady's Clover, Lady's Meat, Laverocks, Lujula, Rabbit Meat, Shamrock, Sheep Sorrel, Sleeping Beauty, Sleeping Clover, Sorrel, Sour Clover, Sour Grass, Sour Sals, Sour Trefoil, Sower Trefoile, Stabwort, Stobwort, Stopwort, Stubwort, Wood-sour, Wood Sorrel, Wood-sower—; *French:* Alleluia, Herbe de boeuf, Oseille ă trois feuilles, Oseille de bucheron, Oseille des bois, Oseille de Pâques, Oseillette, Oxalide, Pain de coucou, Petite oseille, Surelle, Surelle acide, Surelle commune, Surette, Trĕfle aigre—; *German:* Hasenklee, Kuckuckssalat, Sauerklee—; *Greek:* Oxalis—; *Indo China:* Son tac tung thao—; *Irish:* Seamsog—; *Italian:* Acetosella,

Alleluja—; *Japan:* Kagaunegusa—; *Pampangan:* Ayo, Cungi—; *Philippines:* Cungui, Lujula—; *Polish:* Szczawik—; *Portuguese:* Azedinha—; *Roumanian:* Macrisor—; *Russian:* Shchavel, Zayatchi-shchavel—; *Spanish:* Acederilla, Alleluja, Luyula—; *Swedish:* Goekmat—; *Visayan:* Darasig—.

Biophytum DC.

Annual or perennial herbs. Leaves crowded at the ends of the stem and branches, abruptly pinnate; leflets opposite, oblique. Flowers dimorphous, in small umbels; peduncles terminal. Sepals 5, imbricate, lanceolate, acuminate. Petals 5, yellow, connate into a salver-shaped corolla. Stamens 10, distinct; filaments free, the 5 inner longer. Ovary 5-celled; styles 5; stigmas notched at the apex or 2-fid. Capsule ovoid or oblong or subglobose, dehiscing loculicidally into 5 spreading valves. Seeds as in Oxalis.—Species 51.—Tropics.

B. sensitivum DC. is used medicinally in Indo China, the Malay Archipelago and Madagascar.

1. **Biophytum sensitivum** (Linn.) DC. Prodr. I (1824) 690.—Plate 177.

Annual; stem erect, from 2.5-25 cm. long, stout or slender, glabrous or hairy. Leaves sensitive, crowded into a rosette on the top of the stem 3.8-7.5 cm. long; petiole short; rhachis slender, glabrous or hairy; leaflets opposite, 1 cm. long, 6-12 pairs (the terminal pair the largest, the pairs becoming smaller downwards), oblong, obliquely rounded and apiculate at the apex, subsessile, glabrous, paler beneath. Flowers dimorphic, 8 mm. across, yellow; peduncles many, of various lengths up to 10 cm. long, slender, pubescent or glabrous; pedicels many; bracts lanceolate, small, crowded beneath the pedicels. Sepals lanceolate, acute, with parallel nerves. Corolla much exceeding the sepals; lobes rounded, spreading. Style nearly glabrous. Capsules ellipsoid, apiculate, slightly exceeding the sepals; cells few-seeded. Seeds ovoid, transversely striate.

Distribution: Throughout the hotter parts of India.—Very likely distributed all over tropical Africa and Asia to the Philippines.

The leaves are bitter, diuretic; relieve strangury (Ayurveda).

The leaves act as a diuretic when given internally rubbed with water. They allay thirst in bilious fevers.

The seeds are powdered and applied to wounds, and with butter to abscesses to promote suppuration; the root in decoction is given in gonorrhoea and lithiasis.

In the Philippines a decoction of the leaves is used as an expectorant; and the pounded leaves are applied to wounds and bruises.

In Java a decoction of the leaves is given in asthma, phthisis, and snake-bite.

In Madagascar the plant is used as a tonic and mild stimulant.

Bengal: Jhalai—; *Betsileo:* Kelimanganalitra, Tsihilavanandriananahary—; *French:* Alleluya, Sensitive—; *Gujerati:* Jharera, Zarer—; *Hausa:* Ka budi ka noke, Mata gara kafafunki, Rufe rumbre—; *Hindi:* Lajalu, Lakhshana, Zarer—; *Hova:* Kihorohorona, Miorinkorona, Modimodia, Tsimpoafoha—; *Ilocano:* Mahihiin—; *Indo China:* Chua me, Dok han, La me, Talang—; *Kano:* Tsuku, Tsuwuku—; *Marathi:* Jharera, Ladjiri, Lahanamulki—; *Mundari:* Durumbihir, Durumsing, Durumtasad, Janapid, Japidsing, Japidtasad—; *Sakalave:* Hazoandro, Manendilanitra—; *Sanskrit:* Jalapushpa, Jhullapushpa, Jvalatpushpa, Krichhraha, Laghuvrikshaka, Lajjaluka, Panktipatra, Pitapushpa—; *Sinhalese:* Gasnidikumba—; *Tagalog:* Damonghiya, Macahiya—; *Visayan:* Huyahuya—.

AVERRHOA Linn.

Trees. Leaves alternate, imparipinnate, exstipulate. Flowers regular, small, in short panicles. Sepals 5, imbricate. Petals 5, hypogynous, contorted. Glands 0. Stamens 10, very shortly connate at the base into a ring, all perfect or 5 without anthers. Ovary 5-lobed, 5-celled; ovules numerous; styles 5, distinct; stigmas capitate. Berry oblong, indehiscent. Seeds naked or arillate; albumen fleshy, scanty; embryo straight.—Species 2.—Cultivated in all tropical countries.

1. Leaflets 2-5 pairs .... 1. *A. carambola.*
2. Leaflets 5-17 pairs .... 2. *A. bilimbi.*

The two species which constitute this genus are used medicinally in China, Indo China, the Philippine Islands, Mauritius, Brazil, and Guiana.

1. **Averrhoa carambola** Linn. Sp. Pl. (1753) 428.—PLATE 178.

A small tree with close drooping branches. Leaves alternate; leaflets 5-11, irritable to the touch, 3.8-6.3 by 2-3.2 cm., ovate-oblong, acuminate, entire, glabrous or pubescent above, glaucous and glabrous beneath, base oblique, acute; petiolules short, stout, pubescent. Flowers in short racemes chiefly axillary or sometimes springing from the bark. Sepals 3-4 mm. long, glabrous. Petals more than twice as long as the sepals, oblong-obovate, variegated white and purple. Stamens 10, of which 5 are shorter and without anthers, or sometimes 1 or 2 of these longer and antheriferous; filaments dilated at the base. Fruit oblong, acutely angled, yellow. Seeds arillate.

Distribution: Cultivated throughout the tropics. Perhaps a native of Malaya.

The ripe fruit has a hot sharp taste; sweet and sour; digestible; tonic and strengthening; causes biliousness.— The raw fruit is sour; astringent to the bowels; heats the body and causes biliousness (Ayurveda).

The fruit is sour; astringent to the bowels; stops diarrhoea and vomiting; allays thirst; causes biliousness (Yunani).

The ripe fruit is a good remedy for bleeding piles, particularly for internal piles. It is also useful in relieving thirst and febrile excitement.

The dried fruit is given in fevers; it is cooling and possesses antiscorbutic properties. It is considered one of the best Indian cooling medicines.

In Cambodia the leaves are considered antipyretic and antipruritic, the root is administered in cases of poisoning.

In Indo China the leaves are employed in the treatment of scabies; they are also said to be anthelmintic. The fruit is considered antiscorbutic; it is given as a refrigerant in fevers.

In the Philippine Islands the fruit is considered refrigerant and antiscorbutic.

In Mauritius the juice of the fruit is given in dysentery and hepatic colic; a decoction is prescribed in bilious colic and diarrhœa. The uses are the same in French Guiana.

Assam: Kardai—; *Bengal:* Kamarak, Kamranga—; *Bombay:* Karamara, Khamaraka—; *Burma:* Saunggya, Zoun-si, Zoun-ya-si—; *Cambodia:* Spu—; *Canarese:* Darehuli, Kamaranga, Kirinulli—; *Ceylon:* Tamarta—; *Chinese:* Ma Ping Lang, Wu Lien Tzu—; *Deccan:* Khamarak—; *English:* Carambola Apple, Chinese Gooseberry, Coromandel Gooseberry—; *French:* Carambolier—; *Gujerati:* Kamarakha, Tamarak—; *Hindi:* Kamaranga, Karmal, Khamrak—; *Ilocano:* Pias—; *Indo China:* Khe, Khe chua, Khe com, Khe gianh, Khe ta, Mak fuang, Ngu lan tu, Ngu lien tu, Spu—; *Konkani:* Carambol—; *La Reunion:* Carambole—; *Malay:* Kembola—; *Malayalam:* Kamarangam, Pulinji, Saturappuli, Tamaratta—; *Marathi:* Kamarakha, Karmare—; *Portuguese:* Caramboleiro—; *Sanskrit:* Brihaddala, Dharaphala, Karmar, Karmara, Karmaranga, Karuka, Mudgara, Pitaphala, Rujakara, Shukapriya, Shiral—; *Sinhalese:* Kamaranga—; *Tagalog:* Calamias, Camias, Colonarias—; *Tamil:* Kandasagadam, Sagadam, Sigam, Sisam, Tamarattai—; *Telugu:* Karamonga, Tamarta—; *Tulu:* Darepuli—; *Urdu:* Kamarakha—; *Uriya:* Koromonga—; *Visayan:* Cilingiwa, Iba, Quilihgiva—.

2. **Averrhoa bilimbi** Linn. Sp. Pl. (1753) 428; Roxb. Fl. Ind. II (1832) 451.—PLATE 179.

A small tree, 4.5-6 m. high. Leaflets 11-35, entire, 3.8-5 by 2 cm., oblong, more or less pubescent on both surfaces, base usually rounded, somewhat oblique; petiolules 2-4 mm. long, pubescent. Flowers from the trunk and branches; panicles villous. Sepals 4 mm. long, ovate-lanceolate, acute, pubescent. Petals oblong-spathulate, more than twice as long as the sepals. Fruit oblong, obtusely lobed. Seeds exarillate.

Distribution: Cultivated throughout the tropics.—Very likely a native of Malaya.

Astringent, stomachic and refrigerant.

The syrup of the fruit is useful in relieving thirst, febrile excitement, and also in some slight cases of hæmorrhage from the

bowels, stomach, and internal hæmorrhoids. The fruit itself, in the form of curry, is a useful dietary article in piles and scurvy.

In French Guiana the syrup of the fruit, or a decoction of the fruit are prescribed in inflammatory conditions, chiefiy in hepatitis; they are also administered to relieve fever; diarrhœa, and bilious colic.

Bengal: Bilimbi, Blimbi—; *Burma:* Kalazounsi, Kalazounyasi—; *Canarese:* Bilimbi—; *Deccan:* Belambu—; *English:* Bilimbi, Blimbing, Cucumber-Tree—; *French:* Bilimbi—; *Gujerati:* Blimbu—; *Hindi:* Belambu, Bilimbi—; *Indo China:* Khe duong, Khe tay—; *Konkani:* Birimbim—; *La Reunion:* Blimbi—; *Malay:* Bilimbi—; *Malayalam:* Bilimpi, Karichakka, Vilimbi, Vilumpi—; *Marathi:* Bilambi—; *Philippines:* Bilimbines—; *Portuguese:* Bilimbino—; *Sinhalese:* Bilin—; *Tagalog:* Balimbin, Balimbing, Bilimbin—; *Tamil:* Kochittamarattai, Pilimbi, Pulichakkay, Pulima—; *Telugu:* Bilibili, Bilumbi, Gommareku, Pulusukaya—; *Tulu:* Bimbuli—; *Visayan:* Balingbing, Garangan—.

BALSAMINACEAE.

Succulent herbs. Leaves alternate or opposite, simple, penninerved; stipules absent. Flowers zygomorphic, hermaphrodite, brightly coloured, solitary to subumbellate. Sepals 3, rarely 5, often coloured, imbricate, unequal, the lowermost elongated into a tubular spur. Petals 5, the upper one exterior, usually erect, concave, the lateral ones united. Stamens 5; filaments short and broad, connate towards the top; anthers 2-celled, connate around the ovary. Ovary superior, 5-celled, with axile placentas; stigmas 1-5, more or less sessile; ovules numerous. Fruit a succulent capsule opening elastically into 5 twisted valves, rarely a berry. Seeds without endosperm and with straight embryo.—Genera 2. Species 430.—Asia, Africa, Europe, N. America.

The members are reputed astringent, and diuretic.

IMPATIENS Riv. ex Linn.

Annual or perennial herbs, rarely shrubby at the base, usually glabrous. Leaves simple, variously arranged, exstipulate or with stipular glands at the base of the petiole. Flowers irregular, often handsome, axillary, solitary or in racemes (less commonly in scapes), resupinate. Sepals 3 (very rarely 5), coloured, imbricate; 2 anterior when present minute; 2 lateral small, flat, usually green; posterior (lip) (anterior in flower owing to inversion of the flower) large, petaloid, usually produced into a hollow spur. Petals 3 (or 5); anterior (standard) (posterior in flower, outer in bud) erect; lateral (wings) 2-lobed or composed of 2 united together. Stamens 5; filaments short, broad; anthers cohering. Disk 0. Ovary oblong, 5-celled; ovules many in each cell, 1-seriate; stigma sessile, 5-toothed. Capsule short or long, loculicidally dehiscent; valves 5, elastically springing away from a placentiferous axis. Seeds smooth or tubercled, glabrous or hairy; albumen 0; embryo straight.—Species 340.—Tropical and N. temperate regions, especially mountains of India and Ceylon.

1. Mostly annual. Leaves alternate, usually distant. Spur long. Capsule tomentose .... 1. *I. balsamina.*
2. Annual. Leaves all opposite or the upper whorled in threes, (never alternate). Spur as long as or longer than the flower. Flowers 1.3-2.5 cm. across. Wings auricled at the base .... 3. *I. chinensis.*
3. Annual. Leaves opposite, alternate or whorled. Spur short, abrupt, incurved. Flowers red or purple, 3.8 cm. from the base of the lip to the tip of the standard .... 2. *I. tripetala.*

The genus is valved for its emetic, cathartic, diuretic, and antihæmorrhoidal properties.

The following species are used medicinally in Europe—*I. balsamina* Linn., *I. noli-tangere* Linn., *I. parviflora* DC.—; in China —*I. balsamina* Linn., *I. textori* Miq.—; in Indo China and the Philippine Islands—*I. balsamina* Linn.—; in North America—*I. aurea* Muhl., *I. biflora* Walt.—.

1. **Impatiens balsamina** Linn. Sp. Pl. (1753) 938.—PLATE 180.

Annual, erect, 30-90 cm. high; stem glabrous or pubescent, slightly branched. Leaves alternate, up to 15 cm. long, lanceolate, acuminate, deeply serrate, glabrous, decurrent into a glandular petiole. Flowers rose-coloured, showy; pedicels 1-3, axillary, slender, pubescent, shorter than the leaves. Sepals minute, ovate. Standard small, orbicular, retuse, horned. Wings broad, the lateral lobes rounded, the terminal sessile, very large. Lip small, boat-shaped, mucronate. Spur short or long, incurved. Capsules tomentose. Seeds reticulate.

Distribution: Throughout India and Ceylon, up to 5,000 ft.—China, Malaya.

The flower is cooling and tonic; useful when applied to burns and scalds (Yunani).

It is topically used for pains in the joints.

When taken internally it acts as an emetic, cathartic, and diuretic.

Bengal: Dupati—; *Bombay:* Terada—; *Burma:* Dandalet, Panshit—; *Catalan:* Nanos—; *Chinese:* Feng Hsien—; *Dutch:* Balsamien—; *English:* Balsam Weed, Garden Balsam, Jewel Weed, Touch-me-not—; *French:* Balsamine des jardins, Balsamine Jaune, Jalousie, Merveille ă fleurs jaunes—; *Gujarat:* Gulmendi, Pantambol—; *Hindi:* Gulmendi—; *Marathi:* Terada—; *North-Western Provinces:* Mujethi—; *Pampangan:* Camantigui—; *Porebunder:* Gulmendi—; *Punjab:* Bantil, Halu, Juk, Pallu, Tatura, Tilphar, Trual—; *Roumanian:* Balsamina—; *Sinhalese:* Kudalukola—; *Spanish:* Adornos, Balsamina, Nicaragua—; *Tagalog:* Camantigui—; *Urdu:* Gulemendi—; *Uriya:* Haragaura—; *Visayan:* Solonga, Suranga—.

2. **Impatiens tripetala** Roxb. Fl. Ind. Ed. Carey II, 453.

A tall annual herb, glabrous, rarely pubescent. Stem stout, 45-60 cm. high, swollen at the nodes, simple or with opposite branches. Leaves 5-20 cm. long, exclusive of the petiole, which is often 12 cm. long, opposite, alternate or whorled, ovate- or elliptic-lanceolate, acuminate, crenulate, glabrous, or sparsely pubescent above; nerves very numerous; lower crenatures often with bristles. Pedicels slender, solitary or fascicled 12-25 mm., glabrous, bracteate

at the base when fascicled on a short peduncle. Flowers large about 4 cm. from the base of the lip to the tip of the standard, red or purple, glabrous or pubescent. Sepals very small for the size of the flower, subulate, falcate. Standard galeate, spurred at the back. Wings small, with 2 suborbicular lobes. Lip rounded at the base, deeply saccate, suddenly narrowed into an incurved spur. Capsule 12-18 mm. long, ellipsoid, glabrous. Seeds many, pyriform; testa rough, opaque.

Distribution: Sikkim, 2,000—5,000 ft., Bhutan, Duphla Hills, Assam, Khasia Hills, up to 3,000 ft.

The juice of the root is used in hæmaturia. One tola of the juice is mixed with one tola of milk (Carter).

Lakhimpur: Damdoka, Karyabijal—.

3. **Impatiens chinensis** Linn. Sp. Pl. (1753) 937.—*I. fasciculata* Lam.; Wight Ic. t. 748.

Stem 10-50 cm. high, erect, angled, from a rooting prostrate base, glabrous. Leaves all opposite, subsessile, 1.3-10 cm. long, the breadth very variable, linear-oblong or obovate, sharply serrate, the serratures usually terminating in a stiff bristle, the upper surface more or less hairy, the lower silvery-grey, glabrous, base rounded or subcordate; petioles usually almost 0, or, if present, short and broad; stipules linear-lanceolate, recurved. Flowers 1.3-2.5 cm. across, rose-purple or white; pedicels slender, axillary, solitary or fascicled, shorter or longer than the leaves, deflexed in fruit. Sepals 8 mm. long, linear-acute, with a callous point. Standard orbicular, acuminate or horned. Wings semi-obovate, auricled at the base. Spur long, slender, incurved. Capsules 13-20 mm. long, ellipsoid, tapering at both ends, turgid in the middle. Seeds numerous, shortly oblong, smooth, black, shining.

Distribution: W. Ghats, from the Konkan to Travancore, ascending to 8,000 ft. in the Nilgiris. Burma.—China.

The plant is used internally for gonorrhœa and externally for burns.

RUTACEAE.

Shrubs or trees, very rarely herbs. Leaves simple or compound, mostly gland-dotted; stipules absent. Flowers hermaphrodite, rarely male or female, rarely zygomorphic. Sepals 4-5, imbricate, free or connate. Petals imbricate, rarely valvate, mostly free. Stamens the same or double the number of the petals, rarely many, free or rarely united; anthers 2-celled, introrse, opening lengthwise, the connective often glandular at the apex. Disk usually present within the stamens. Ovary superior, syncarpous and often 4-5-celled, or sometimes the carpels free towards the base, or rarely altogether free; styles free or connate; ovules often 2, superposed. Fruit baccate, drupaceous or coriaceous, rarely capsular. Seeds with or without endosperm; embryo straight or curved.—Genera 100. Species 800.—Tropical and temperate regions, especially S. Africa and Australia.

A. Herbs, rarely shrubby. Flowers hermaphrodite. Disk thick. Ovary deeply 3-5-lobed. Styles basilar or ventral, free or united. Cells 3- or more- ovuled. Fruit capsular. Albumen fleshy
  I. Flowers regular
    a. Petals 4-5. Stamens 8-10. Ovary sessile .... RUTA.
    b. Petals 4-5. Stamens 12-15 .... PEGANUM.
  II. Flowers irregular .... DICTAMNUS.
B. Shrubs or trees. Flowers usually polygamous. Disk free, rarely absent. Ovary deeply 2-5-lobed. Styles basilar or ventral, more or less free. Cells 2-ovuled. Fruit-carpels capsular.
  I. Leaves opposite. Stamens 4-5 .... EVODIA.
  II. Leaves alternate. Stamens 3-5 .... ZANTHOXYLUM.
C. Shrubs or trees. Flowers usually polygamous. Disk free. Ovary entire. Style single. Cells 1-2-ovuled. Fruit syncarpous. Seeds albuminous. Cotyledons usually flat
  I. Stem usually prickly. Leaves compound. Petals and stamens 2-5 each .... TODDALIA.
  II. Stem unarmed. Leaves 1-3-foliolate. Petals 2-4. Stamens in male flowers 2-3-times as many as the petals .... VEPRIS.
  III. Stem unarmed. Leaves 1-3-foliolate. Petals 4. Stamens 8 .. ACRONYCHIA.
  IV. Stem unarmed. Leaves simple. Petals and stamens 4-5 each .... SKIMMIA.
D. Shrubs or trees. Flowers hermaphrodite. Petals and stamens free or connate. Ovary entire. Style simple. Cells 1-∞ -ovuled. Berry usually pulpy. Seed exalbuminous
  I. Ovules solitary or twin in each cell
    a. Style very short, persistent .... GLYCOSMIS.
    b. Unarmed. Leaves pinnate. Style jointed on the top of the ovary. Deciduous

1. Petals imbricate. Filaments linear-subulate. Cotyledons fleshy, plano-convex	MURRAYA.
2. Petals imbricate. Filaments dilated below. Cotyledons fleshy, plano-convex	CLAUSENA.
c. Armed (except some species of LIMONIA). Leaves 3-8-foliolate	
1. Calyx 4-5-lobed. Stamens 8 or 10	LIMONIA.
2. Calyx cupular. Stamens 8 or 10	LUVUNGA.
d. Unarmed or armed. Leaves 1-foliolate	
1. Anthers linear-oblong. Disk elongate	PARAMIGNYA.
2. Anthers ovate or cordate. Disk cupular	ATALANTIA.
II. Ovules many in each cell	
a. Stamens 20-60. Ovary ∞-celled. Leaves 1-foliolate ...	CITRUS.
b. Stamens 10-12. Ovary incompletely 5-6-celled. Leaves pinnate	FERONIA.
c. Stamens 30-60. Ovary 8-∞ -celled. Leaves 3-foliolate ..	AEGLE.

Bitter, acrid, stimulant, tonic, and antiperiodic.

The following substances have been isolated:—(1) hydrocarbons —limonene, phellandrene, pinene—; (2) alcohols—hendecyl alcohol, geraniol, linalool, nerol—; (3) aldehydes—benzaldehyde, citral, citronellal—; (4) ketones—methylheptyl, methylnonyl—; (5) acids —aurantiamaric, citric, euodic, hesperic—; (6) esters—methyl anthranilate, methyl salicylate—; (7) saponins; (8) glucosides— aeglin, aurantiamarin, eldrin, hesperidin, isohesperidin, murrayin, naringin, rutin, rutoside, skimmin—; (9) bitters—limonin—; (10) alkaloids— artarine, berberine, cuspareine, cusparidine, cusparine, dictamnine, evodiamine, evodine, galipidine, galipine, galipoidine, harmaline, harmalol, harmine, γ-homochelidonine, jaborine, pseudojaborine, pilocarpidine, pilocarpine, isopilocarpine, pseudopilocarpine, pilosine, rutaecarpine, skimmianine, stachydrine, α-xantherine, β-xantherine—.

OFFICIAL:—Pilocarpine (France);—hydrochloride (Austria, Belgium, Denmark, France, Germany, Holland, Hungary, Italy, Japan, Russia, Spain, Sweden, Switzerland, Turkey, United States);— nitrate (France, Great Britain, Holland, Spain, United States).

Barosma betulina Bartling (Portugal, Spain); *B. betulina* (Thunb.) Bart. & Wendl. (Great Britain); *B. betulina* (Thunberg) Bartling (United States); *B. crenata* Kuntze (Spain); *B. crenulata* Hook. (Portugal, Spain); *B. crenulata* (Lime) Hooker

(United States); *B. serratifolia* Willd. (Portugal, Spain); *B. serratifolia* (Curtis) Willdenow (United States).

Citrus spp. (all pharmacopœias).

Crataeva Marmelos Linn.=*Aegle Marmelos* Correa da Serra (Portugal).

Galipea Cusparia St. Hil.=*Bonplandia trifoliata* Willd., *G. officinalis* Hancoch (Portugal).

Pilocarpus spp. (Great Britain, Japan); *P. Jaborandi* Holmes (Austria, France, Spain, Switzerland, Turkey, United States); *P. microphyllus* Stapf. (Belgium, Great Britain, United States); *P. pennatifolius* Lem. (France, Portugal, Spain).

Ruta bracteosa De Cand.=*R. angustifolia* Lowe (Portugal); *R. graveolens* Linn. (France, Switzerland)=*R. hortensis* Mill. (Portugal); *R. montana* Clus.=*R. sylvestris* Mill. or *R. tenuifolia* Brot. (Portugal).

Winterana Canella Linn.=*Canella alba* Murray (Portugal).

Evodia Forst.

Trees or shrubs, unarmed. Leaves opposite, simple or 1-3-foliolate or imparipinnate; leaflets entire, pellucid-punctate. Flowers small, unisexual, in axillary paniculate cymes. Sepals 4-5, imbricate. Petals 4-5, sessile, valvate or slightly imbricate. Disk 4-5-lobed. Stamens 4-5, inserted at the base of the disk, in female replaced by staminodes; filaments subulate; anthers oblong. Ovary deeply 4-lobed, 4-celled; ovules 2 in each cell; style basilar; stigma 4-lobed. Fruit of 4 coriaceous, 3-valved, 1-seeded cocci; endocarp horny, elastically separable, 2-lobed. Seeds oblong; testa bony or crustaceous, shining; hilum linear; albumen fleshy; embryo straight, cotyledons ovate.—Species 45.—Tropics except America.

A. Leaves trifoliolate .... 1. *E. lunur-ankenda.*
B. Leaves pinnate
  1. Leaves 20-30 cm. .... 2. *E. fraxinifolia.*
  2. Leaves 30-45 cm. .... 3. *E. rutaecarpa.*

The genus is bitter, tonic, and febrifuge.

The following species are used medicinally in China—*E. rutaecarpa Hook.f.* and Th.—; in Indo China—*E. fraxinifolia* Hook. fil.,

E. lunur-ankenda Merr., *E. rutaecarpa* Hook.f. & Th., *E. viridans* Drake—; in La Reunion—*E. aubertia* Cordem., *E. obtusifolia* DC.—.

1. **Evodia lunur-ankenda** Merr. in Philipp. Journ. Sc. Bot. VII (1913) 378.—*E. Roxburghiana* Benth. Fl. Hongkong, 59.—*Zanthoxylum triphyllum* Juss.; Wight Ic. t. 204.

A small tree with smooth grey bark. Leaves 3-foliolate, petioles up to 10 cm. long; leaflets glabrous, shining, obovate or lanceolate, obtuse or acuminate, 5-12.5 cm. long or longer in young plants; nerves 10-18 pairs; cymes variable, sometimes large and spreading. Seeds black, shining.

Distribution: W. Peninsula, elsewhere?

The root-bark, boiled in oil, is given to improve the complexion.

The juice of the leaves is prescribed in fever.

In Indo China the plant is used as a bitter tonic, the bark and the leaves are given in fever.

Indo China: Bey samlek, Bi bai, Dau dau, Kom la van, Mat, Swai snor—; *Malayalam:* Kanila, Kattuchampakam—; *Sanskrit:* Vanashampaga—; *Sinhalese:* Ankenda, Lunu, Lunu-ankenda, Nebede—; *Tagalog:* Matangdiablo, Piras—.

2. **Evodia fraxinifolia** Hook. f. in Fl. Brit. Ind. I, 490.

A small much-branched densely leafy tree, smelling strongly of Caraway when bruised. Branchlets thick, terete. Leaves 20-30 cm., spreading, bright green, quite glabrous throughout; petiole cylindric; leaflets 3-5 pairs, 10-23 cm., shortly petioled, oblong or oblong-lanceolate, acuminate, straight or falcate, quite entire or crenulate, base rounded often oblique, nerves spreading, slender, terminal leaflet often long-petioled. Cymes broad, brachiate, pubescent on short stout compressed peduncles, axillary and terminal, clothed with fine close-set pubescence; branches stout; bracts minute. Flowers 4-5-merous, shortly pedicelled, white, male nearly 13 mm. diam. Sepals small, obtuse. Petals imbricate, pubescent within. Stamens exceeding the petals, filaments somewhat hairy; anthers broad. Ovary glabrous; style short, stigma capitate. Fruit 13 mm. diam., red, glabrous; carpels not separating to the base, very coriaceous. Seed broadly elliptic, slightly compressed; testa dark brown shining.

Distribution: Subtropical Himalaya from Nepal to Sikkim, 4,000—7,000 ft., Khasia Mountains, 3,000—5,000 ft.—Cochin-China.

The plant is used as an antipyretic in Indo China.

Indo China: Dau dau—; *Lepcha:* Kanu—; *Nepal:* Kanukpa—.

3. **Evodia rutaecarpa** Hook. f. & Th. in Fl. Brit. Ind. I, 490.

A small densely foliaged green tree, inodorous, clothed throughout with soft velvety pubescence. Leaves 30-45 cm.; petiole terete, stout; leaflets about 5 pairs, subsessile, oblong-acute, usually rounded and oblique at the base, margin quite entire, undersurface wooly, nerves faint. Cymes brachiate, 7.5-10 cm. diam,. terminal; branches very stout, peduncles very short, stout and as well as the pedicels and calyx tomentose. Flowers about 8 mm. diam. Petals nearly glabrous externally, pubescent within. Stamens not much exceeding the petals, filaments hairy; anthers very large, ovate, 2-lobed at the base. Fruit pustular, 13 mm. diam.; carpels 4, opening at the apex.

Distribution: Temperate region of the Sikkim Himalaya, 7,000—10,000 ft.—China, Japan.

In China the medicinal properties attributed to the plant are almost innumerable. It is generally recognized as a useful stimulant, carminative, and stomachic.

Annam: Ngo thu—; *Chinese:* Wu Chu Yu—; *Indo China:* Ngo thu du—.

RUTA (Tourn.) Linn.

Strong-smelling glanduloso-punctate herbs, often shrubby below. Leaves alternate. Flowers numerous, in terninal corymbs, cymes or panicles, greenish or yellow. Calyx short, 4-5- lobed or -partite, persistent. Petals 4-5, concave, often toothed or ciliate, imbricate. Disk thick, urceolate, 8-10-glandular or 8-10-foveolate. Stamens 8-10, inserted round the base of the disk, the alternate shorter; filaments dilated at the base. Ovary sessile, deeply 3-5-lobed, 3-5-celled; ovules pendulous from the axis of the cells; style central, stigmatose at the apex. Capsule 4-5-lobed; lobes indehiscent or dehiscing at the apex, many-seeded. Seeds angled; testa pitted;

albumen fleshy; embryo slightly curved; cotyledons sometimes 2-partite.—Species 50.—Mediterranean, Asia.

1. Leaves petioled, triangular-ovate, decompound .... 1. *R. graveolens.*
2. Leaves oblong, linear-oblong or somewhat spathulate, pubescent .... 2. *R. tuberculata.*

The genus is acro-narcotic. Externally the leaves act as a rubefacient and emmenagogue. Internally the seeds are antispasmodic and anthelmintic.

The following are used medicinally in Europe—*R. graveolens* Linn., *R. montana* Mill.—; in Indo China—*R. graveolens* Linn.—; in North Africa—*R. graveolens* Linn., *R. tuberculata* Forsk.—; in South Africa—*R. graveolens* Linn.—.

OFFICIAL:—The leaf of *R. graveolens* Linn. (Switzerland), the flowering plant (France).

The plant: *R. graveolens* Linn. (*R. hortensis* Mill.) *R. montana* Clus. (*R. sylvestris* Mill. or *R. tenuifolia* Brot.), *R. bracteosa* De Cand. (*R. angustifolia* Lowe) in Portugal.

1. **Ruta graveolens** Linn. Sp. Pl. (1753) 383, var. *angustifolia* Hook f. Fl. Brit. Ind. I, 485.—PLATE 181.

Leaves petioled, decompound; segments cuneate, spathulate-oblong or linear-oblong. Flowers in divaricately spreading corymbs; pedicels longer than the capsule; bracts lanceolate. Sepals triangular, acute. Petals oblong-obovate, pectinate, abruptly clawed. Capsules obtuse, shortly pedicelled. Seeds angled.

Distribution: Cultivated throughout India.—Westwards to the Canaries.

The plant is bitter; laxative; heating to the body; removes "kapha" and "vata" (Ayurveda).

There are three varieties: garden, forest, mountain. The plant is tonic, digestive, diuretic, emmenagogue, abortifacient, anti-aphrodisiac; heats the body; increases mental activity; useful in gleet and urinary discharges (Yunani).

Rue is an acro-narcotic poison. When fresh its topical action is acrid, and if much handled it produces redness, swelling and even vesication.

It may be given internally in hysteria, amenorrhœa, epilepsy,

flatulent colic, etc., and externally may be used as a rubefacient. The oil is the best form for administration, but rue tea is a popular remedy.

The herb and the oil act as stimulants, chiefly of the uterine and nervous systems. Rue in all its forms is considered injurious to pregnant women.

The dried leaves are used as a fumigatory for children suffering from catarrh; powdered and in combination with aromatics they are given in dyspepsia. With the fresh leaves a tincture is made which is used as an external remedy in the first stages of paralysis. In the Punjab, the leaves are used as a remedy for rheumatic pains.

In the Central Provinces the leaves pounded with salt are applied locally for scorpion sting.

Rue is used by Arabs in Palestine and Syria as a preventive of the ill effects of water drunk at unaccustomed springs; they either chew the leaves, or soak the plant in water (Fullerton).

The plant is used as an emmenagogue in Indo China; and the seeds are considered a good ascaricide in Annam. In some parts of India the juice is given to children as a remedy for worms.

A decoction of the leaf is used in fevers in South Africa. The leaf juice is given to infants and children with convulsions and fits, and the bruised herb is placed in hollow teeth and the ears to relieve toothache and earache respectively. Sometimes, when *in extremis*, children are bathed in a decoction of the plant; and this is credited with producing recovery. An infusion is used by adults for respiratory and heart diseases.

The Chuanas and Kwenas administer a decoction in large doses to ease childbirth.

In the Transvaal a honey of the leaf is used for cardiac asthma, and the bruised leaf is given in jaundice and infantile diarrhœa.

Commercial oil of rue is quite ineffective as an anthelmintic. The higher boiling fraction acts as a fairly potent vermicide to hookworms, but is ineffective for removal of ascarids (Caius and Mhaskar).

This plant has strong antispasmodic properties; the juice is generally prescribed on the West Coast in convulsions of children and in acute bronchitis and pneumonia. The juice undoubtedly possesses

antispasmodic and expectorant properties. I have found it useful in the bronchial catarrh and acute bronchitis of children (Koman).

The leaves are useless as a cure for scorpion sting (Caius and Mhaskar).

Pure oil of rue consists of 90 per cent of methylnonylketone. The plant is said to contain the glucoside rutin.

Afrikaans: Binnewortel, Wynruit, Wynryk—; *Arabic:* Aruda, Fejan, Fidjel—; *Bengal:* Ermul, Ispund—; *Bombay:* Satap—; *Canarese:* Havunanju, Nagadali, Sadabu, Sadapa—; *Central Provinces:* Sitab—; *Ceylon:* Tirumutipachi—; *Chinese:* Tch'eou Ts'ao—; *Danish:* Rude—; *Deccan:* Pismarum, Sadaf, Satari—; *Dutch:* Ruit, Wijnruit—; *English:* Ave Grace, Common Rue, Countryman's Treacle, Garden Rue, Herb-grace, Herb of grace, Herb-repentance, Herb of repentance—; *French:* Herbe de grace, Peganion, Rouda, Ruda, Rue commune, Rue domestique, Rue fetide, Rue des jardins, Rue odorante, Rue puante—; *German:* Aalraute, Alraute, Englische Weinblaetter, Feldraute, Hofraute, Gartenraute, Kreuzraute, Raute, Ruette, Rutenkraut, Rutheil, Weinraute, Wienraute—; *Greek:* Piganos—; *Gujarat:* Satapa—; *Hindi:* Pismarum, Sadab, Satari—; *Indo China:* Cuu ly huong, Van hyong—; *Italian:* Ruta—; *Japan:* Matskaseso—; *Java:* Inghu—; *Languedoc:* Carieiro—; *Malaya:* Sadab, Sadsu—; *Marathi:* Satapa—; *Persian:* Sudab—; *Polish:* Ruta—; *Portuguese:* Arruda, Ruda—; *Punjab:* Katmal, Sudab—; *Roumanian:* Ciuma rea, Iarba ciumei—; *Russian:* Ruta, Ruta pakhuchaya—; *Sanskrit:* Guchhapatra, Pitapushpa, Sadapaha, Sarpadanshta, Somalata, Vishapaha—; *Sinhalese:* Aruda—; *Spanish:* Arruda, Ruda, Ruda comun, Ruda hortense—; *Swedish:* Ruta, Vinruta—; *Tamil:* Aruvadam, Arvada, Pambugolli—; *Telugu:* Aruda, Sadapa—; *Tulu:* Sadapu—; *Urdu:* Sudah—; *Uriya:* Maruya—; *Visayan:* Dura—.

2. **Ruta tuberculata** Forsk. Fl. Aegypt.—Arab. (1775) 86.

Stem erect or ascending, terete, branched, woody, minutely glandular, glaucous, glabrous. Leaves 1.3-2.5 cm. long, linear-oblong or somewhat spathulate, obtuse or subacute, pustular and pubescent, base narrowed into the petiole. Cymes dichotomously

branched; flowers 6 mm. across, the central one of each cyme sessile, the others shortly pedicelled. Sepals small, broadly elliptic, about 2.5 cm. long. Petals 3-4 mm. long, yellow, elliptic-oblong, obtuse, concave, entire, glabrous. Filaments dilated and hairy at the base. Capsules 5-lobed, 5-celled, tubercled, often with 2 seeds in each cell.

Distribution: Sind, Baluchistan.—Egypt, Algeria.

It is used for the same purposes as *R. graveolens.*

Arabic: Fidjel—.

Peganum Linn.

Branching perennial-rooted herbs. Leaves alternate, not glandular, entire or irregularly multifid; stipules setaceous. Flowers solitary on subterminal leaf-opposed pedicels, white. Sepals 4-5, narrow, often foliaceous and pinnatifid, open in aestivation, persistent. Petals 4-5, subequal, imbricate. Disk annular or cup-shaped. Stamens 12-15, inserted at the base of the disk, some without anthers; filaments dilated below; anthers linear. Ovary globose, deeply 2-3-lobed, 2-3-celled; ovules many in each cell, suspended by short funicles from the central angle; styles basal, twisted, 2-3-keeled above the middle, the keels stigmatose. Fruit globose, 3-4-celled, dry and dehiscing with 3 valves, or baccate and indehiscent; cells many-seeded. Seeds angled; testa spongy, scrobiculate; albumen fleshy; embryo curved.—Species 4.—Mediterranean, Asia, N. America.

P. harmala Linn. is used medicinally in all the countries where it is found growing.

1. **Peganum harmala** Linn. Sp. Pl. (1753) 444.—Plate 182.

A bush, 30-90 cm. high, dichotomously and corymbosely branched. Leaves 5-7.5 cm. long, multifid, the segments narrow, linear, acute. Flowers 2-2.5 cm. across, solitary, sessile or pedicelled. Sepals narrow, linear, acute, usually exceeding the petals. Petals white, elliptic-oblong, Capsules globose, 4.5-8 mm. diam., deeply lobed, veined, glabrous.

Distribution: Bihar, U. Provinces, Deccan, Konkan, Cutch, Sind, Baluchistan, Waziristan.—Persian Baluchistan, Persia, Mediterranean, Central Asia.

There are two varieties—dark-seeded, and white-seeded—with the same therapeutic properties. Expectorant, strengthening and fattening, anthelmintic, diuretic, laxative, emmenagogue; enriches the blood; useful in lumbago, paralysis, weakness of the muscles, weakness of the brain, diseases of children, ophthalmia, rheumatism; relieves asthma and chronic bronchitis. Inhalation of the smoke relieves toothache, and pain in the liver (Yunani).

The plant is considered aphrodisiac, emmenagogue, and galactagogue. It is sometimes used as an abortifacient.

In the Punjab, the seeds are considered narcotic and given in fevers and colic. The decoction of the leaves is given for rheumatism, and the powdered root mixed with mustered oil, is applied to the hair to destroy vermin (Stewart). The seeds are also used against weakness of sight and retention of urine (Honigberger).

The root is applied to kill lice.

The seeds have been used as a remedy for tapeworm in man.

In Sibi the smoke of the burning seeds is supposed to purify the air; in Shahrig the seeds are taken for indigestion (Hughes-Buller).

According to Moodeen Sheriff the seeds are narcotic, antispasmodic, hypnotic, anodyne, nauseant, emetic and emmenagogue. He recommends their employment in cases of asthma, hiccough, hysteria, rheumatism, impaction of calculus in the ureter, and of gallstone in the gall duct, colic, jaundice, dysmenorrhœa and neuralgia; in all of which they relieve pain and procure sleep. The relief afforded by this drug in simple cough and a few other pectoral affections is generally satisfactory. It is also a good nauseant and depressant emetic in its largest medicinal doses; but it cannot be employed as such in general practice, because its use in so large a quantity is always accompanied by its narcotic and hypnotic actions.

The seeds of this plant contain three alkaloids: harmaline, harmalol, and harmine.

Flury (*Arch. exp. Path. Pharm.*, 1910) states that harmaline has an anthelmintic action. Gunn and Marshall (*Proc. Roy. Soc. Edin.*, 1920) have found that harmine and harmaline are useful in malaria.

Arabic: Harmal, Hurmul—; *Baluchistan:* Ispanthan, Spand,

Spanj—; *Bengal:* Isband—; *Bombay:* Hurmal, Hurmaro, Ispand—; *Brahui:* Kisankur—; *Canarese:* Simegoranti—; *Catalan:* Harmala, Ruda borda—; *Deccan:* Hurmaro, Vilayatiisband, Vilayatimhendi—; *English:* Foreign Henna, Harmal, Syrian Rue, Wild Rue—; *French:* Harmala, Harmel, Rue des bois, Rue de montagne, Rue sauvage—; *Gujerati:* Ispun—; *Hindi:* Harmal, Isbandlahouri, Kaladana, Lahouri-hurmul—; *Kharan:* Ispandan—; *Las Bela:* Gandako—; *Marathi:* Harmala—; *Ormara:* Gandako—; *Persian:* Isband, Ispand—; *Punjab:* Hurmul, Isboundlahouri, Lahourihurmud, Spelane—; *Pushtu:* Spailanai—; *Quetta-Pishin:* Spanda—; *Shahrig:* Spand—; *Sibi:* Harmal, Harmaro, Spanda—; *Sind:* Hurmul, Isbundlahouri, Lahourihurmul—; *Spanish:* Gamarza—; *Tamil:* Simaiyalavinai, Simaiyaravandi—; *Telugu:* Simagoranta, Simagoronti—; *Upper Bolan:* Kasankur—; *Urdu:* Ispand—; *Zhob:* Spanda—.

DICTAMNUS Linn.

Species 1.—Europe, Asia.

1. **Dictamnus albus** Linn. Sp. Pl. (1753) 383.—PLATE 183.

A perennial, heavy-scented herb, covered with small, raised glands. Stems robust, erect, 30-60 cm., branched. Leaves gland-dotted, odd-pinnate, 15-30 cm.; leaflets 9-15, opposite, sessile, ovate-lanceolate, 5-10 cm., toothed. Flowers 2-sexual, showy, 2.5-3.8 cm. long, pink or white, in an erect, terminal raceme 15-30 cm. long. Sepals 5, narrowly lanceolate, persistent. Petals 5, much longer than the sepals, lanceolate, nearly equal, spreading. Stamens 10, as long as the petals, hairy, glandular, bristle-tipped. Ovary nearly sessile, ovoid, rough with glandular hairs, 5-celled; ovules 3 or 4 in each cell; style long, simple. When ripe the carpels separate as 2-3-seeded, tomentose, beaked, distinct fruits 1.2 cm. long. Seeds black, shining.

Distribution: Temperate W. Himalaya, from Kashmir to Kunawer, 6,000—8,000 ft.—Japan, Siberia, Dahuria, westward to France and Spain.

The bark of the root is an aromatic bitter prescribed for most nervous diseases, also for intermittent fever, amenorrhoea, hysteria, etc.

In Indo China the root is used in the preparation of a drink for scabies and other skin affections.

In Malaya the root is prescribed in skin diseases. Internally it is given for its tonic, sedative, and antipyretic qualities.

Cantonese: Pak Sin—; *Catalan:* Dictam blanch, Dictam real, Gitam, Timo real—; *Chinese:* Pai Hsien, Pai Yang—; *Dutch:* Effenkruid, Witte diptam—; *English:* Bastard Dittany, Fraxinella, White Dittany—; *French:* Dictame blanc, Fraxinelle—; *German:* Aeschenwurzel, Ascherwurzel, Aschwurzel, Escherwurzel, Hirtwurzel, Spechtwurzel, Springwurzel, Tiptap, Weissen Diptam, Weisser Tucktuk—; *Greek:* Dictamnos liki—; *Indo China:* Bach tien—; *Italian:* Dittamo, Dittamo bianco, Frassinella, Limonella—; *Malaya:* Pak sin—; *Portuguese:* Fraxinella—; *Roumanian:* Frasinel—; *Russian:* Dikee dadiyan—; *Spanish:* Chitan, Dictamo blanco, Dictamo real, Fresnillo—.

ZANTHOXYLUM Linn.

Trees or erect or climbing shrubs, often armed with stout prickles. Leaves alternate, trifoliolate or imparipinnate; leaflets opposite or alternate, entire or crenate, often oblique, pellucid-punctate. Flowers small, in cymes, often unisexual. Calyx 3-8-fid, rarely 0. Petals 3-5, sometimes 0. Disk small or obscure. Stamens 3-5, hypogynous, reduced to scales in male flowers. Ovary of 1-5 carpels, rudimentary in the male; styles free or connate above; stigma capitate; ovules 2 in each cell. Fruit of 1-5 carpels, dehiscing ventrally.—Species 20.—Temperate Asia, N. America.

A. Cymes axillary or axillary and terminal. Branches alternate
- I. Leaves 5-∞-foliolate. Petiole winged. Flowers apetalous
  - a. Petiole and rhachis usually broadly winged .... 1. *Z. alatum.*
  - b. Petiole and rhachis narrowly winged .... 2. *Z. acanthopodium.*
- II. Leaves 5-∞-foliolate. Petiole not winged. Flowers polypetalous.
  - a. Leaflets alternate and opposite, 3-10-pairs .... 3. *Z. oxyphyllum.*
  - b. Leaflets 2-3-pairs, opposite .... 4. *Z. hamiltonianum.*

B. Cymes terminal. Branches opposite. Flowers polypetalous. Leaves 5-∞-foliolate. Petiole not winged .... 5. *Z. budrunga.*

The genus is noted for its febrifuge, sudorific, and diuretic properties.

The following species are used medicinally in China—*Z. ailanthoides* Sieb. & Zucc., *Z. bungei* Planch., *Z. piperitum* DC., *Z. schinifolium* Sieb. & Zucc.—; in Indo China—*Z. acanthopodium* DC., *Z. ailanthoides* Sieb. & Zucc., *Z. alatum* Roxb., *Z. avicennae* DC., *Z. budrunga* Wall., *Z. cuspidatum* Champ., *Z. nitidum* DC., *Z. oxyphyllum* Edgew., *Z. schinifolium* Sieb. & Zucc.—; in the Philippine Islands—*Z. avicennae* DC., *Z. oxyphyllum* Edgew.—; in North America—*Z. americanum* Miller, *Z. clava-herculis* Linn.—; in South America—*Z. ochroxylon* DC.—; in the West Indies—*Z. clava-herculis* Linn.—; in Australia—*Z. brachyacanthum* F. Muell.—; in West Africa—*Z. melanacanthum* Planch., *Z. senegalense* DC.—; in La Reunion—*Z. heterophyllum* Smith.—; in South Africa—*Z. capense* Harv., *Z. thunbergii* DC.—.

1. **Zanthoxylum alatum** Roxb. Hort. Beng. (1814) 72.—Plate 184.

An evergreen or subdeciduous shrub or occasionally a small tree up to 6 m. high and stem 23 cm. diam. Young shoots glabrous. Branches armed with nearly straight prickles up to 1.2 cm. long, raised on old stems on the top of an oval woody pedestal. Twigs smooth, greenish, with scattered pale lenticels. Bark pale brown, rather deeply furrowed, corky. Blaze 7.5-15 mm., pale yellowish brown with or without paler streaks, soft, the whole rapidly darkening on exposure. Leaves imparipinnate, 10-23 cm. long, the rhachis with a foliaceous green wing up to 4 mm. broad, often bearing straight pink prickles up to 15 mm. long. Leaflets 5-11, lanceolate, more or less serrate and each serrature with a pellucid gland, sparsely pellucid-punctate, acute or acuminate, sessile, glabrous, dark glossy green above, pale beneath; the terminal 6-11 by 1.5-2.8 cm., the lateral smaller. Flowers polygamous, yellow, in dense pubescent lateral panicles 2.5-7.5 cm. long. Fruit of 1-3 carpels. Carpels 4 mm. diam., globose, red, glabrous. Seed solitary, 2.5 mm. diam., globose, shining, black.

Distribution: Trans-Indus, Punjab along the foot of the Himalaya from the Indus eastwards up to 5,000 ft., Kumaon 5,000—7,000 ft., eastwards to Bhutan, Khasia Hills 2,000—3,000 ft.

The fruit is sweetish, bitter, hot; tasty and digestible; appetiser;

anthelmintic; removes "kapha" and "vata"; pain, tumours, abdominal troubles; useful in eye and ear diseases, diseases of the lips, headache, heaviness, leucoderma, asthma, troubles of the spleen, difficult micturation (Ayurveda).

The seeds are sharp with a good taste and smell; tonic; very astringent to the bowels and useful in diarrhoea; carminative, bechic, pectoral; good in brain diseases and insanity; useful in stomatitis; strengthen the liver, purify the blood; remove foul smell from the mouth (Yunani).

The seeds and the bark are used as an aromatic tonic in fever, dyspepsia, and cholera; the fruit as well as the branches and thorns are used as a remedy for tooth-ache; also deemed stomachic and carminative and employed to intoxicate fish.

The flowers in combination with other drugs are prescribed in snake-bite (Nighantaratnakara, Yogaratnakara).

The aromatic seeds are considered stomachic in Indo China. They are given in the form of powder for colic and worms.

The drug is regarded as an excellent stimulant, carminative, and sudorific in Malaya.

The flower is not an antidote to snake venom (Mhaskar and Caius).

Arabic: Fagireh—; *Bashahr:* Timbar, Timru—; *Bengal:* Gaira, Nepalidhamia, Tun—; *Canarese:* Jimmi, Tumburudu—; *Cantonese:* Fa Tsiu—; *Chinese:* Hua Chiao—; *Hindi:* Darmar, Nipalidhanya, Tejbal, Tejphal, Tezmal, Timbur, Timur, Tumru, Tun—; *Indo China:* Chuc giep tien—; *Jaunsar:* Temru, Timbar, Timru—; *Kumaon:* Timru, Timur—; *Lepcha:* Sungrukung—; *Malaya:* Fah chew—; *Nepal:* Baletimur, Timur—; *North-Western Provinces:* Jwarantika, Tejbal, Timru—; *Persian:* Kababe jahanulsha—; *Punjab:* Kababa, Tejbal, Tezbal, Timmal, Timru—; *Sanskrit:* Andhaka, Dviha, Gandhalu, Mahamuni, Sanuja, Saurabh, Sauraja, Sauravanaja, Shulaghna, Sphutal, Sputithaphala, Sugandhi, Tikshnapatra, Tikshnaphala, Tikshnavalka, Tumbaru, Tumburu—; *Saora:* Kondakasimanda, Kondakasimi—; *Urdu:* Kababe—; *Uriya:* Tundopoda—.

2. **Zanthoxylum acanthopodium** DC. Prodr. II, 727.—PLATE 185B.

An erect shrub 1.2-3 m. high with stem up to 7.5 cm. diam. Young shoots glabrous or shortly pubescent. Stems and branches armed with broad-based straight prickles up to 1.5 cm. long, raised, raised on old stems on the top of an oblong woody pedestal. Bark greenish ashy, smooth, with numerous pale circular raised lenticels. Blaze 2.5 mm., greenish. The whole plant very aromatic. Prickles, young shoots, and rhachis and midrib of leaflets usually tinged pink or with pink glandular spots when young. Leaves imparipinnate, 11-25 cm. long, the rhachis with a foliaceous green wing up to 5 mm. broad, the rhachis and midrib usually armed with straight prickles up to 1.2 cm. long. Leaflets 5-13, subequal, 3.8-7.5 cm. long, oblong-lanceolate or the basal pair often ovate, acute, serrate with a gland at the base of each tooth, gland-dotted, shortly pubescent on both surfaces, main lateral nerves distinct 10-20 pairs, sessile. Flowers 3.8-5 mm. diam., dull purplish red, in axillary rounded panicles up to 1.2 cm. long, usually 2 together in each leaf-axil. Stamens twice the length of the sepals. Anthers yellow. Fruit of 1-4 carpels. Carpels 4 mm. diam., globose, slightly hairy. Seed solitary, 2.5 mm. diam., globose, shining, black.

Distribution: Hot valleys of the subtropical Himalaya from Kumaon to Sikkim, up to 7,500 ft., Khasia Hills, 4,000—6,000 ft.

The bitter aromatic seeds are considered sudorific and febrifuge in Indo China.

In India the plant is used for the same purposes and in the same ways as *Z. alatum.*

Bengal: Tambul—; *Hindi:* Darmar, Nipalidhanya, Tejphal, Tumra—; *Indo China:* Kho samak—; *Lepcha:* Nangryupot—; *Nepal:* Bogaytimur.

3. **Zanthoxylum oxyphyllum** Edgew. in Trans. Linn. Soc. XX, 42.—Plate 186.

An evergreen shrub with sarmentose weak rambling stems usually supported by the surrounding trees and shrubs and reaching 4.5 m. high and 5 cm. diam. Young shoots glabrous. Stems and branches armed with straight or hooked prickles up to 1.8 cm. long, raised on old stems on the top of an oblong woody pedestal. Twigs smooth,

green, not lenticellate. Bark greenish brown, smooth, with conspicuous pale circular lenticels arranged in longitudinal lines. Blaze 2.5 mm., greenish. Leaves imparipinnate, 18-40 cm. long, rhachis not winged but profusely armed with purplish prickles above and below, the upper ones straight or sometimes absent, the lower usually recurved. Leaflets 11-27, subequal, 3-9 by 1.5-4 cm., ovate to oblong-ovate, acuminate, base rounded glandular-serrulate, gland-dotted beneath, the lower pairs usually alternate, the upper opposite, glabrous. Petiolules 1.2-4 mm. long, puberulous. Flowers 5 mm. diam., dark purplish-red, in terminal pubescent panicles 2.5-7.5 cm. long, usually with a few prickles on the rhachis. Anthers bright yellow. Fruit of 1-5 carpels. Carpels 5-7.5 mm. diam., globose, dull red, glabrous. Seed solitary, 5 mm. diam., shining black.

Distribution: Throughout the hills of Kumaon between 6,000—9,000 ft., eastwards to Sikkim, and Bhutan, Khasia Hills, 4,000—6,000 ft.

In India the plant is used for the same purposes as *Z. alatum.*

In the Philippine Islands the bark is considered stimulant, stomachic, and digestive, and it is given in colic. It is administered in fevers as a sudorific.

Ilocano: Casabang—; *Lepcha:* Siritakdangji—; *Nepal:* Bhoinsitimur, Laharatimur, Timur—; *Philippines:* Sagaycangay, Saladay—; *Tagalog:* Cayutane—; *Visayan:* Salay—.

4. **Zanthoxylum hamiltonianum** Wall. Cat. 7117.—Plate 187.

An evergreen shrub, probably scandent, sparingly armed with short recurved prickles, glabrous, or the young parts tomentose or pubescent. Leaves unpaired-pinnate, 15-20 cm. long, the petiole and rhachis rather terete, glabrous or pubescent, on the back armed with recurved prickles; leaflets in 2-3 pairs with an odd one, on short petioles, oblong to ovate-oblong, 5-15 cm. long, abruptly and rather long acuminate and notched, coriaceous, entire or nearly so, glossy on both sides, glabrous, or beneath somewhat pubescent. Cymes panicled, very slender, 7.5-10 cm. long, glabrous pubescent or tomentose. Flowers small, shortly pedicelled. Fruiting carpels obliquely ovoid, the size of a pepper-kernel, pitted, glabrous. .

Distribution: Assam and Burma.

The fruit is used for its aromatic and stimulant properties.

Nepal: Parpartimur, Purpuraytimur—.

5. **Zanthoxylum budrunga** Wall. Cat. 1211.—*Z. Rhetsa* DC. Prodr. I, (1824) 728.—*Fagura Budrunga* Roxb. Fl. Ind. I (1832) 417.—Plate 188 and Plate 185A (under *Z. Rhetsa* DC.).

A small or moderate sized tree with pale corky bark, covered with conical prickles on stems and branches and sometimes a few small ones on the leaf-rhachis; young prickles upcurved. Leaves clustered towards the ends of the stout branchlets, equally or unequally pinnate, 30-60 cm. long, including the petiole. Leaflets 5-20 pairs, 7-15 cm. long, oblong or lanceolate, caudate, entire or crenate, when crenate with a large gland in the sinus, very oblique at base, rounded on the upper side, with the lamina shorter, narrower and acute on the petiole on the lower side. Flowers in large terminal paniculate cymes often more than 30 cm. broad, the branches opposite, angled; bracts minute, caducous; peduncles very long, sometimes prickly. Calyx-lobes minute, triangular. Petals 4, elliptic, 2.5 mm. long, yellow, valvate. Ripe carpels 5 mm. diam., solitary, spherical, tubercled. Seeds globose, bluish black, smooth, shining, tasting of black pepper.

Distribution: Konkan, Deccan, S. M. Country, N. Kanara, W. Ghats in S. Kanara, Mysore, Malabar, Annamalais and Travancore at low elevations, Orissa, Sylhet, Khasia Hills, Chittagong, Pegu and Martaban down to Tenasserim.

The fruit is hot and bitter; digestive, appetiser; removes "kapha"; cures asthma, bronchitis; removes pain; useful in heart diseases, in diseases of the mouth, teeth, and throat; relieves hiccough, good for piles (Ayurveda).

The fruit is used for its aromatic and stimulant properties. The Mohamedan physicians consider it to be hot and dry, and to have astringent, stimulant and digestive properties. They prescribe it in dyspepsia arising from atrabilis; also in some forms of diarrhœa.

The root-bark is reputed in Goa to be purgative of the kidneys. The fruit with ajwan seeds is powdered, steeped in water and distilled, and the distillate given as a remedy for cholera. In rheumatism, the fruit is given in honey.

The carpels yield an essential oil and the seeds a fixed oil

(Sanjiva Rao, Sudborough, and Watson). The essential oil is used for cholera.

Assam: Brojonali—; *Bengal:* Bazinali—; *Bombay:* Chirphal, Kokli, Sessal, Tephal, Tessul, Tijabal, Triphal—; *Burma:* Mayanin—; *Canarese:* Aremadalu, Aremapala, Jimmi, Jummina, Sesele—; *Gujarat:* Tejabala—; *Hindi:* Badrang, Jaladhari, Pepuli—; *Indo China:* Muong tu, Soug, Tchor, Xuong—; *Lambadi:* Jummi, Melsoro—; *Malayalam:* Karimurikku, Kattumurikku, Kuyitti, Mulakila, Mullilam—; *Marathi:* Chiphal, Chirphala, Kokli, Sessal, Tejabala, Tirpani, Tirphal, Tisal, Tisul, Triphal—; *Nepal:* Timur—; *Sanskrit:* Ashvaghra, Atitejani, Bidalaghni, Laghuvalkala, Mahanjasi, Parijata, Shita, Sutejasi, Suvarnanakuli, Tejanya, Tejasvini, Tejavati, Tejovha, Tikta, Valkali—; *Sinhalese:* Kattukina—; *Tamil:* Iratchai—; *Telugu:* Racha, Rachamam—; *Tulu:* Kavati—.

TODDALIA Juss.

Species 1.—Tropical Asia, Africa, Madagascar.

T. asiatica Lam. and *T. lanceolata* Lam. are used medicinally in La Reunion.

1. **Toddalia asiatica** Lam. Ill. II (1793) 116.—*T. aculeata* Pers. Syn. I (1805) 249; Wight Ill. t. 66.—PLATE 189 (under *T. aculeata* Pers.).

An evergreen climber with rambling stems up to 15 m. high and 10 cm. diam. Bark pale brown, fairly smooth, with numerous conspicuous paler circular lenticels and armed with small hooked prickles about 2.5 mm. long, raised on old stems on the top of a conical woody pedestal up to 1.2 cm. high. Blaze 2.5-7.5 mm. crisp, pale yellow closely mottled with sclerotic orange portions in the outer half, turning pinkish brown on exposure. Leaves alternate, digitately trifoliolate. Petiole 1.5-3 cm. long. Leaflets sessile, 5-10 by 1.8-3.8 cm., obovate-oblong or oblong, crenulate, shortly blunt-acuminate, base acute, glabrous, coriaceous, dark shining green above with many slender parallel nerves inconspicuous beneath. Flowers 3.8-6 mm. diam., pale greenish yellow, in axillary and terminal

pubescent panicles 2.5-6.3 cm. long. Fruit 7.5-12 mm. diam., subglobose, with 5 shallow grooves, yellowish. Seeds several, surrounded by a colourless mucilage.

Distribution: Konkan, Deccan, S. M. Country, N. Kanara, in almost all districts of the Madras Presidency, Ceylon, Kumaon between 1,000 and 4,500 ft., eastwards to Bhutan, up to 5,000 ft., Khasia Hills up to 6,000 ft.—Sumatra, Java, China, Philippines, tropical Africa, Mascarene Islands.

All the parts of the plant are very pungent, especially the roots when freshly cut. The fresh bark of the root is administered for the cure of hill fever. The fresh leaves are eaten raw for pains in the bowels.

The root-bark is an aromatic tonic, stimulant and antiperiodic; useful in constitutional debility, and in convalescence after febrile and other exhausting diseases. It is given in a weak infusion to the quantity of half a teacupful in the course of the day; the leaves are also sometimes used for the same purpose.

Rheedes states that the unripe fruit and root are rubbed down with oil to make a stimulant liniment for rheumatism.

This aromatic plant is very much employed in La Reunion as a stimulant, tonic, stomachic and vulnerary. The root is bitter, astringent, antidiarrhœic, and antiperiodic; it is administered in the form of a powder or in decoction.

The plant (Jangli-kali-mirchi) has been recommended by Dr. Bidie of Madras as a bitter tonic in debility, after malarial fevers, and in convalescence from exhausting diseases. I have tried it in the malarial cachexia of fevers and found that it acts as a good stomachic tonic, improving the appetite, and aiding digestion. An infusion of the root-powder, in the proportion of an ounce of the powder to ten fluid ounces of boiling water, makes a capital preparation. Dose, one to two ounces, twice or thrice daily (Kirtikar).

The bark of the root of this plant is said to be a specific for hill and jungle fever (probably malarial fever). The entire plant is said to possess febrifuge properties. An infusion was made of the bark and prescribed for several mild cases of malarial fever in the out-patient department with very beneficial results (Koman).

"In our series of cases of malarial fever caused by *P. vivax*

and *P. falciparum*, tincture toddaliae, prepared from the root bark, had no marked effect on the parasites in the blood or on the temperature. Its toxic effects on paramaecia are very feeble compared to that of cinchona. Evidence is thus brought to show that the drug is useless in the treatment of malaria" (Vyas and Bhatia; *Ind. Med. Gaz.*, April, 1932).

The plant contains the alkaloid berberine.

Bengal: Kadatodali—; *Bombay:* Junglikalimirchi—; *Burma:* Kyanzah, Tsuhun—; *Canarese:* Kaduhakukare, Kadumenasu, Kaypele, Macimullu, Mullumacige, Pargiballi—; *Ceylon:* Kandai, Kudurmiris—; *Deccan:* Janglikalimirchi—; *English:* Lopez-root Tree, Forest Pepper—; *French:* Bois de patte de poule, Bois pied de poule, Bois de ronde, Toddali—; *Hindi:* Dahan, Janglikalimirch, Kanj—; *Kamba:* Nuungua—; *Kikuyu:* Muroro, Murorowe—; *Kumaon:* Kanj—; *La Reunion:* Patte de poule ă piquants, Ronce rouge—; *Lepcha:* Laphijirik, Suphyeuzhu—; *Lumbwa:* Simbeyuet—; *Malayalam:* Kakkattuttali, Karamullu, Kattukarimilaku, Mulakutanni, Tutali—; *Marathi:* Junglikalimirchi, Limri, Manger—; *Meru:* Mukongura—; *Nepal:* Meinkangra, Meinkara—; *Rajputana:* Dahan, Lahan—; *Sanskrit:* Dahana, Kanchana—; *Sinhalese:* Kudumirish, Kudumirishvel—; *Tamil:* Kattumilagu, Kichilikaranai, Milagaranai, Mullukkaranai—; *Telugu:* Kondakasinda, Kondamirepu, Merapugandra, Mirapakondra, Mullamorinda, Vanakasinda—; *Tulu:* Kadukare—; *Uriya:* Hanomoriso, Tundapara, Tundopoda, Tundupara—.

VEPRIS Comm.

Trees or shrubs, unarmed. Leaves alternate, 1-3-foliolate, the leaflets usually petiolulate, gland-dotted. Flowers small, in terminal or axillary panicles. Calyx small, saucer-shaped, 2- or more- lobed. Petals 2-4, lanceolate or ovate, more or less imbricate. Stamens in male flowers twice or three times as many as the petals, inserted under the disk, filaments slender, anthers ovate; in female flowers reduced to minute staminodes with small rudimentary anthers. Ovary in male flowers small, ovoid, 2-cleft at apex; in female flowers

globose, 2-4-celled; styles 0; stigma capitate; ovules in each cell 2, collateral. Fruit globose or oblong, 2-4-celled, fleshy. Seeds one in each cell, flattened, oblong, testa crustaceous; albumen fleshy; embryo flat, cotyledons thick, ovate; radicle stout.—Species about 16.—Africa, Mascarene Islands, India.

V. lanceolata Don. is used medicinally by the Zulus.

1. **Vepris bilocularis** Engler in Engler & Prantl Pflanzenf. III, 4 (1896) 178.—*Toddalia bilocularis* W. & A. Prodr. (1834) 149; Bedd. Ic. t. 167.

A handsome, middle-sized tree with dark green foliage, unarmed. Leaves 3-foliolate; petioles 3.8-7.5 cm. long, terete, glabrous, leaflets 7.5-19 by 3.8-7.5 cm., elliptic-lanceolate, bluntly acuminate, notched at the tip, entire glabrous, base acute; lateral nerves numerous, parallel and uniting into one that is parallel to and close to the margin; petiolules 6-10 mm. long. Flowers terminal and from the upper axils. Calyx cupular. Petals usually 2 (sometimes 3), orbicular-oblong. Stigma large, peltate. Fruit as large as a small cherry, 2-celled.

Distribution: N. Kanara, forests of Malabar, Annamalais, Travancore, up to 4,000 ft.

A decoction of the root is given for biliousness.

The wood, boiled in oil, is used in asthma, rheumatism, eye and ear diseases.

Skimmia Thunb.

Unarmed shrubs, strongly scented. Leaves alternate, simple, entire. Flowers polygamous, crowded in terminal panicles. Calyx, 4-5-lobed, imbricate. Petals 4-5, valvate or slightly imbricate. Disk obsolete. Stamens 4-5, imperfect in the female flower. Ovary entire, 2-5-celled; style single or 0; stigma capitate, 2-5-lobed; ovules solitary. Fruit a fleshy drupe with 2-5 cartilaginous 1-seeded stones. —Species 5.—Himalaya to Japan.

S. japonica Thunb. of Indo China, China, and Japan contains a glucoside, skimmin, and an alkaloid of unknown composition, skimmianine. The plant is used medicinally.

1. **Skimmia laureola** Sieb. & Zucc. ex. Walp. Rep. V, 405.—Blatter Beautiful Fl. Kashmir I (1927) 76, pl. 18, f. 1.—PLATE 191.

An erect evergreen glabrous shrub 0.6-1.2 m. high with stems up to 2.5 cm. diam. Bark fairly smooth. Blaze yellow. All parts strongly aromatic. Leaves crowded towards the ends of the branches, 7.5-15 by 2-3.8 cm., closely gland-dotted, oblong-lanceolate or oblanceolate, acute or acuminate, thick, softly coriaceous, lateral nerves obscure. Petiole 2.5-7.5 mm. long, stout, flattened above. Flowers 7.5-12 mm. diam., pale greenish yellow, fragrant, in compact, erect, terminal panicles 3.8-5 cm. long. Stamens yellow, as long as the petals. Drupe ovoid, 1.2-1.8 cm. long, red when ripe.

Distribution: Temperate Himalaya from Kashmir to Mishmi 6,000—10,000 ft., Khasia Hills, 5,000—6,000 ft.—Afghanistan.

The smoke of the burning leaves is supposed to purify the air. The Pandits of Kashmir prepare incense from them.

The essential oil obtained from the leaves by steam distillation contains mainly 1-linalyl acetate; 1-linalool, an unidentified hydrocarbon, and a complex mixture of sesquiterpene alcohols and esters are likewise present (Simonsen).

Garhwal: Nair—; *Jaunsar:* Gurlpata, Kathurchara—; *Kumaon:* Gurlpata, Nehar—; *Kunawar:* Patrang—; *Lepcha:* Timburnyok—; *Nepal:* Chumlani—; *Punjab:* Barru, Ner, Shalangli—; *Ranikhet:* Naira—.

GLYCOSMIS Correa.

Unarmed shrubs or small trees. Leaves 1-foliolate or imparipinnate; leaflets alternate. Flowers small, in panicles. Calyx 4-5-lobed; lobes broad, imbricate. Petals 4-5, imbricate. Stamens 8-10, free, inserted round a disk. Ovary 2-5-celled; style short; stigma capitate; ovules one in each cell. Fruit a dry or pulpy berry, 1-3-seeded.—Species 6.—Indo-Malayan.

G. cochinchinensis Pierre is used medicinally in Indo China and the Malay Peninsula.

1. **Glycosmis cochinchinensis** Pierre ex Engler in Engler & Prantl. Nat. Pflanz. III, 4 (1896) 4.—*G. pentaphylla* Correa in Ann. Mus. Hist. Nat. VI (1805) 386.

An erect shrub 0.9-1.8 m. high. Twigs tomentose, terete. Leaves alternate, 3-7-foliolate; the rhachis terete, tomentose, stout, up to 18 cm. long. Leaflets alternate or subopposite, 7.5-18 by 3.8-9 cm., elliptic rhomboid or ovate, acuminate or acute, base cuneate usually acute and oblique, entire rarely obscurely toothed, pubescent on both surfaces especially along the nerves, glandular especially on the leaf-margin, pellucid-punctate, thinly coriaceous aromatic when crushed, with about 7-12 pairs of lateral nerves. Petiole 1.25-5 mm. long. Flowers 5 mm. diam., yellowish tetramerous, in terminal softly pubescent panicles 10-30 cm. long. Berry 1-1.8 cm. long, ovoid, pale orange, verrucose with tufts of short hair or glabrescent when ripe.

Distribution: Throughout India, Ceylon.—Malaya, China, Borneo, Australia.

The roots pounded and mixed with sugar are given in cases of low fever.

The wood bruished with water is administered internally as an antidote for snake-bite.

In Tongking an infusion of the dried leaves is given as a tonic and appetiser to women after delivery.

The wood is not an antidote to snake venom (Mhaskar and Caius).

Bengal: Ashshoura—; *Bombay:* Kirmira—; *Burma:* Obok, Tanshouk, Tawshauk—; *Canarese:* Gurodagida, Guruvede, Jangama, Manikyan, Vademadige—; *Goa:* Kirmiramenki—; *Hindi:* Bannimbu, Girgitti, Pilrupotala, Potali—; *Indo China:* Buoi bung, Com ruou, Dom phlang, Kom som sum, Ko muong—; *Malay:* Nerapih—; *Malayalam:* Malampanal, Panal—; *Marathi:* Kirmira—; *Sanskrit:* Ashvashakota—; *Saora:* Gonji—; *Tagalog:* Guinguen—; *Tamil:* Anam, Kattukkonji, Konji—; *Telugu:* Golugu, Gongi, Gonjipandu, Gunji, Kondagolugu—; *Tulu:* Panthele—.

ACRONYCHIA Forst.

Trees. Leaves opposite or alternate, very rarely 3-foliolate; leaflets large, quite entire, pellucido-punctate. Flowers in axillary and terminal corymbs, polygamous. Calyx short, 4-lobed, imbricate, sometimes enlarged after flowering. Petals 4, much longer than the calyx, spreading or revolute, valvate. Disk thick, 8-gonous, tomentose or pubescent. Stamens 8, inserted beneath the disk; filaments subulate, the alternate longer. Ovary inserted in the hollowed apex of the disk, pubescent or tomentose, 4-celled; ovules 2 in each cell, superposed; style terminal, short or long; stigma 4-grooved. Fruit 4-celled, the cells 1-2-seeded, or drupaceous with a coriaceous or bony putamen, or capsular and loculicidally 4-valved. Seeds usually exserted and dependent from a slender funicle; testa black; albumen copious; embryo straight; cotyledons oblong, flat.—Species 20.—Tropical Asia and Australia.

A. laurifolia Blume is used medicinally in China and Indo China.

1. **Acronychia laurifolia** Bl. Bijdr. 245.—*Cyminosma pedunculata* DC. Prodr. I, 722; Wight Ill. I, t. 65.—PLATE 190.

A small tree about 3.5-9 m. tall. Branchlets puberulous. Leaves subopposite thinly coriaceous dark shining green, oblong-elliptic or obovate obtusely acuminate or blunt, base narrowed, glabrous; nerves 14-18 pairs looping within the edge, 5-15 cm. long, 2.8-6 cm. wide; petioles 1.2-2 cm. long. Cymes axillary, slender, 5 cm. long, with few opposite branches; peduncles 6.3 cm. long. Flowers narrow in bud, 9-20 mm. across when open, greenish white. Sepals semi-orbicular. Petals linear-oblong, villous inside. Drupe globose, green, like a small orange, 1 cm. through (4-angled when dry).

Distribution: Konkan, N. Kanara, W. Ghats of Madras Presidency in hill forests up to 6,000 ft., S. Deccan slopes, N. Circars, Ceylon, Orissa, Sikkim, 3,000—4,000 ft., Khasia Hills, up to 4,000 ft., Assam, Chittagong, Burma, Malay Peninsula.—Cochin-China, Malay Islands.

The leaves are burnt near small-pox patients.

In Indo China the aromatic bark is used as a tonic, and is also prescribed in scabies.

In Ceylon the bark is used as an external application to sores and ulcers.

Canarese: Bhutali, Sonemau—; *Chinese:* Chiang Chen Hsiang—; *English:* Clawflowered Laurel, Laka Wood—; *Indo China:* Bai bai, Buoi bong, Cavi, Chai dai, Cut sat, Kramol, Mak thao sang—; *Malay:* Gambadak, Mentua, Keminiyan, Rejang—; *Malayalam:* Muttanari, Vitukanali—; *Sinhalese:* Akenda, Ankenda—; *Tamil:* Kattukkanni, Muttainari—; *Uriya:* Madhugodiyamado—.

MURRAYA Koen. ex Linn.

Shrubs or small trees, unarmed. Leaves pinnate; leaflets alternate, petioluled, cuneate or oblique at the base. Flowers solitary, axillary, or in terminal corymbs or axillary cymes. Calyx 5-fid or 5-partite. Petals 5, free, imbricate. Stamens 10, free, the alternate shorter; filaments linear-subulate; anthers small, short. Disk stipitiform. Ovary seated on the disk, 2-5-celled, narrowed in the style; ovules 1-2 in each cell, superposed or collateral; style elongate, at length deciduous; stigma capitate. Berry small, 1-2-celled, oblong or ovoid, 1-2-seeded. Seeds with a woolly or glabrous testa; cotyledons equal.—Species 5.—Indo-Malayan.

1. Leaves 10-20-foliolate .... 1. *M. koenigii.*
2. Leaves 3-8-foliolate .... 2. *M. paniculata.*

The genus is stimulant, astringent, tonic, and stomachic.

M. paniculata Linn. is used medicinally in China and Indo China, *M. koenigii* Spreng. in Indo China and the Philippine Islands.

1. **Murraya koenigii** Spreng. Syst. Veg. II (1825) 315.—*Bergera Koenigii* Linn. Mant. 563; Wight Ic. t. 13.—PLATE 192.

A small tree with dark grey bark. Leaves imparipinnate, up to 30 cm. long; petioles terete, pubescent; leaflets 11-25, alternate, 2-5 by 1-2.5 cm., obliquely ovate or somewhat rhomboid, acuminate, obtuse or acute, tip usually notched (the lower leaflets often suborbicular or obovate, much smaller than the upper), irregularly crenate-dentate, glabrous or nearly so above, pubescent beneath, sprinkled with black dots; petiolules very short. Flowers white, in

much-branched terminal peduncled corymbose cymes; peduncles and pedicels pubescent. Calyx pubescent; lobes subacute, triangular. Petals 6 mm. long, linear-oblong, rounded at the apex, gland-dotted. Filaments dilated at the base. Ovary 2-celled; ovules solitary (rarely 2), in each cell. Fruit ovoid or subglobose, 6-10 mm. diam. apiculate, rough with glands, black, 2-seeded.

Distribution: Konkan, W. Ghats of Bombay to Travancore and Ceylon, Deccan, S. M. Country, in most districts of Madras Presidency, chiefly in the N. Circars, along the foot of the Himalaya from Kumaon to Sikkim, up to 5,000 ft., Bengal, Burma.

The leaves and roots are bitter, acrid, cooling; alexeteric, anthelmintic, analgesic; cure piles; allay heat of the body, thirst, inflammation, itching; useful in leucoderma and blood disorders (Ayurveda).

The bark and root are used as stimulants. Externally, they are used to cure eruptions and the bites of poisonous animals.

The green leaves are described to be eaten raw for the cure of dysentery; they are also bruised and applied externally to cure eruptions. An infusion of the toasted leaves is used to stop vomiting. In the Punjab, the leaves are applied to bruises. In Bombay, the leaves are given in decoction with bitters as a febrifuge. The plant is credited with tonic and stomachic properties. The root is slightly purgative.

In Lakhimpur (Assam) the juice of the root is said to be good for pain associated with kidney (Carter).

In Indo China the fruit is considered astringent, and the leaves are used in diarrhœa and dysentery.

In Ceylon a decoction of the leaves is given internally in snake bite, and the bark and the root are applied externally to the bitten part (Robert).

The leaves are not an antidote to snake venom. The root and bark are useless as an external application in the treatment of snake-bite (Mhaskar and Caius).

Bengal: Barsunga, Kariaphyli—; *Bhabar:* Ganma—; *Bombay:* Goranimb, Karriapat, Karrinim—; *Burma:* Pidosin, Pindosin—; *Canarese:* Karibevana, Karibevu, Gandhabevu—; *Ceylon:* Karavempu, Watukarapincha—; *Deccan:* Karepak, Karyapak, Karyapat—;

Dehra Dun: Gandhela—; *English:* Curry-leaf Tree—; *Gujarat:* Goranimb, Kadhilimbdo—; *Hindi:* Bursunga, Gandhela, Gandhla, Harri, Katnim—; *Hyderabad:* Chanangi—; *Indo China:* Dok ki be, Xan troc—; *Kumaon:* Gandhela, Gandla, Gani—; *Lakhimpur:* Maskoita—; *Malayalam:* Kareapela, Kariyapala, Karivepu, Marisangam—; *Marathi:* Gandla, Jhirang, Jirani, Karepacha, Karipat, Karhinimb, Kudianim, Puspala—; *Michi:* Umwah—; *Nepal:* Mechiasag—; *North-Western Provinces:* Bowala, Gandla, Gani, Gant—; *Porebunder:* Midholimbdo—; *Punjab:* Bowala, Gandalu, Gandanim, Gandi, Gandla—; *Sanskrit:* Alakavhaya, Chhardighna, Girinimba, Kadarya, Kalasaka, Krishnanimba, Krishnapatra, Mahanimba, Maharishta, Nimbapatra, Priyasala, Raman, Shuklasara, Surabhi, Surabhinimba, Varatikta—; *Sinhalese:* Karapincha, Karripincha—; *Tamil:* Karuvembu, Karuveppilai, Kattuveppilai—; *Telugu:* Karepeku, Karivepaku, Karivemu—; *Tulu:* Besoppu—; *Uriya:* Basango, Bhursunga, Marisingipotoro, Sanomorisingi—.

2. **Murraya paniculata** Jack in Mal. Misc. I, no. 5 (1820) 31.—*M. exotica* Linn. Mantiss. II (1771) 563.—*Chalcas paniculata* Linn. Mantiss. I (1767) 68.

A small evergreen tree; bark smooth, yellowish white; branches slender. Leaves imparipinnate, 10-18 cm. long; petioles glabrous; leaflets 3-7, alternate, 3.8-7.5 by 2-3.8 cm. (the terminal leaflet the largest), ovate-elliptic, obovate or rhomboid, usually acuminate with a notched tip, entire, glabrous and shining, base acute, oblique; petiolules 3-6 mm. long. Flowers very fragrant, campanulate, solitary or in terminal and axillary corymbs. Sepals small, glandular, oblong, obtuse. Petals white, 1.3-2 cm. long, oblong-lanceolate, subobtuse, erect at the base, the upper half spreading. Filaments flat, linear, tapering beneath the anther. Ovary 2-celled. Berry 1.3-2 cm. diam., oblong or ovoid, pointed smooth, 1-celled, 2-seeded, red when ripe.

Distribution: Outer Himalaya from the Jumna eastwards, ascending to 4,500 ft., Assam, Upper and Lower Burma, Satpura Range, Hills of the Peninsula, Ceylon.—China, Australia, Pacific Islands.

Among the Mundas the ground bark of the tree is used as a drink in snake bites and rubbed on the bitten limb. The ground bark of

the root is eaten and rubbed on in body ache. The powdered leaf is used as an application to fresh cuts, and a decoction of the leaves is drunk in dropsy.

The leaves are stimulant and astringent and are administered in the Philippines in the treatment of diarrhoea and dysentery. They are given in the form of an infusion in the proportion of 15 grammes to a litre of water. The bark of both the stem and the root is also used as an antidiarrhoeal.

The plant contains a glucoside, murrayin.

Andamans: Machalla—; *Bengal:* Kamini—; *Bombay:* Chulajuti, Manchulajuti—; *Brazil:* Murta—; *Burma:* Makay, Thanatkha—; *Canarese:* Angarakana, Karibevu, Nagadala, Pandry—; *Chinese:* Shan Fan—; *Dun:* Bilgar—; *French:* Buis de Chine—; *Gond:* Raketberar—; *Hindi:* Bibsar, Juti, Marchula—; *Ilocano:* Banaasi, Bannaasi—; *Indo China:* Cut gie, Nguyet quat, Nguyet qui, Nguyet quoi—; *Kolami:* Otali—; *Kumaon:* Murchob—; *Lambadi:* Kallo, Selokadiro—; *La Reunion:* Buis—; *Lepcha:* Shitzen—; *Marathi:* Chalajuti, Kunli, Kunti, Marchulajuti—; *Mundari:* Atilsing—; *Nepal:* Simali—; *North-Western Provinces:* Marchula—; *Pampangan:* Banati, Camunin—; *Pangasinan:* Banasi—; *Pyinmana:* Moksongayok—; *Sadani:* Atilgach—; *Saora:* Sayyur—; *Sinhalese:* Attaireya, Etteriya—; *Tagalog:* Comuning, Molauin, Molavin—; *Tamil:* Kariveppilai, Konji, Panjandali, Simaikkonji, Vengarai—; *Telugu:* Ganarenu, Karepaku, Nagagolugu, Nagagolunga—; *Uriya:* Birijugi, Pondoka—; *Visayan:* Banati, Camunin—; *Zambales:* Banaot—.

CLAUSENA Burm. f.

Trees or shrubs, unarmed. Leaves imparipinnate, usually deciduous; leaflets membranous. Flowers small, in terminal or axillary cymes, panicles or lax racemes. Calyx 4-5- lobed or -partite. Petals 4-5, free, usually tender, elliptic or rotund, imbricate. Stamens 8-10, free, the alternate a little shorter; filaments dilated in the middle or below the middle, subulate at the apex; anthers short. Disk stipitiform. Ovary 4-5- (rarely 2-3-) celled, stalked; ovules 2 in each cell, collateral or superposed; style usually distinct, at length

deciduous; stigma obtuse, entire or 2-5-lobed. Berry ovoid, oblong or globose, 2-5-celled. Seeds oblong; testa membranous; cotyledons equal, plano-convex.—Species 20.—Palaeotropics.

1. Leaves 3-7-foliolate. Leaflets 12.5-23 cm. .... 2. *C. pentaphylla.*
2. Leaves 15-30-foliolate. Leaflets 5-9 cm. .... 1. *C. excavata.*
3. Leaves 5-9-foliolate. Leaflets 5-10 cm. .... 3. *C. wampi.*

C. anisata Hook.f. is used medicinally in the Gold Coast, *C. wampi* Oliver in Indo China and the Malay Peninsula, *C. inaequalis* Benth. in South Africa.

1. **Clausena excavata** Burm. Fl. Ind. (1768) 87.—*Amyris sumatrana* et *punctata* Roxb. Fl. Ind. II (1832) 250, 251.

An evergreen shrub, rarely growing out into a little tree of 3-4.5 m. high, all softer parts more or less pubescent or puberulous. Leaves unpaired-pinnate, with a shortly pubescent or puberulous terete rhachis; leaflets in 7-15 pairs with an odd one, alternate, on short hirsute petiolules, lanceolate or oblong-lanceolate, oblique, acuminate or the lower ones more or less blunt, obsoletely toothed or waved, more or less pubescent especially beneath, or sometimes glabrescent above, 3.8-7.5, rarely 10 cm. long. Flowers small, greenish yellow, on short but slender pedicels, usually hirsute outside, forming terminal tawny hirsute or puberulous panicles usually shorter than the leaves. Petals nearly 4 mm. long; ovary tawny hirsute, almost sessile, the style short and thick. Berries ovoid or oblong, the size of a pea, at least while young sparingly pilose, dotted, 1-2-seeded, crowned usually with the short style.

Distribution: Sub-Himalayan tract from Nepal eastward, Chota Nagpur, Orissa, Chittagong, Burma.—Malay Archipelago.

The plant is used for digestion and as a diuretic. The dried and powdered rootstock is also used by the Kols for decayed teeth.

In Cambodia the stem is considered bitter, tonic, and astringent, the infusion is given in colic with or without diarrhoea.

Burma: Seitnan—; *Cambodia:* Santhrok damney—; *Ceylon:* Pannai, Purankainari—; *Kolami:* Dukipotum, Otearmu—; *Malay:* Chenama, Cherek hitam—; *Sinhalese:* Migongkarapichigass—; *Tagalog:* Calomata, Camanguianis, Cayumanis, Maisipaisi—; *Uriya:* Agnijhal—.

2. **Clausena pentaphylla** DC. Prodr. I, 538.—*Amyris pentaphylla* Roxb. Fl. Ind. II (1832) 247 (erravit in descript. ovulor.).

An erect shrub 0.9-1.8 m. high. Twigs tomentose, terete. Leaves alternate, 3-7-foliolate; the rhachis terete, tomentose, stout, up to 18 cm. long. Leaflets alternate or subopposite, 7.5-18 by 3.8-9 cm., elliptic rhomboid or ovate, acuminate or acute, base cuneate usually acute and oblique, entire rarely obscurely toothed, pubescent on both surfaces especially along the nerves, glandular especially on the leaf margin, pellucid-punctate, thinly coriaceous, aromatic when crushed, with about 7-12 pairs of lateral nerves. Petiolule 1.5 mm. long. Flowers 5 mm. diam., yellowish, tetramerous, in terminal softly pubescent panicles 10-30 cm. long. Berry 10-18 mm. long, ovoid, pale orange, verrucose with tufts of short hair or glabrescent when ripe.

Distribution: Sub-Himalayan tract of Kumaon (up to 2,000 ft.) and Nepal, Sikkim, Oudh forests, Champaran.

The bark is a much-valued Indian veterinary medicine. It is powedered and applied with sweet oil to flesh wounds. For sprains of tendons and ligaments, bruises and abrasions, the powder is first boiled in sweet oil for fifteen minutes and applied as a poultice. Also used for ossification (H. de Lisle; Polo in India, p.185).

Hindi: Ratanjote, Rowana, Surjmukha, Teyrar, Tharu—.

3. **Clausena wampi** Blanco Fl. Filip. 358.

A small glabrous tree with a sweet terebinthine odour; branches petioles and inflorescence pustular. Leaves 5-9-foliolate, 10-25 cm.; petiole cylindric, glabrous or hairy; leaflets petioled, oblique, broad, ovate, elliptic or lanceolate, waved or crenulate, 5-10 cm., shining above, tip obtuse notched. Panicle large, erect, compound, branched from the base, branches stout. Flowers 8 mm. diam., white, 4-5-merous, pedicels very short, stout; buds globose; ovary pilose usually 5-celled, style very short glabrous above, stigma 5-lobed, ovules 2 in each cell superposed. Petals broad, concave. Fruit nearly globose; rind tough, covered with glands full of green balsamic oil. Seed solitary.

Distribution: Very likely a native of China.—Cultivated in India.

In Tongking the dried fruit with the seeds is given in bronchitis.

Chinese: Huang P'i—; *Indo China:* Hoang bi, Hoang bi moc, Hong bi—; *Malaya:* Wong phee—; *Philippines:* Uampit—; *Tagalog:* Huampit, Wampi—; *Tongking:* Hong bi—.

Limonia Linn.

Shrubs or small trees, often spiny. Leaves alternate, 3-foliolate or imparipinnate; petiole winged; leaflets opposite or alternate. Flowers paniculate, racemose or fascicled. Calyx 4-5- lobed or -partite; lobes equal. Petals 4-5, imbricate. Disk annular or stipitiform. Stamens 8-10, free, subequal; filaments subulate; anthers cordate or linear-oblong. Ovary oblong, 4-5-celled; ovules 1-2 in each cell; style short, thick, at length deciduous; stigma obtuse or capitate. Berry globose, 1-4-celled, 1-4-seeded. Seeds imbedded in mucilage; cotyledons fleshy.—Species 10.—Tropical Africa and Asia.

Therapeutically the genus has very little importance.

1. **Limonia crenulata** Roxb. Corom. Pl. I, t. 86.—*L. acidissima* Linn. Sp. Pl. (1762) 554.—Plate 193 (under *L. acidissima* Linn.).

A spinous glabrous shrub or small tree; spines sharp, 1.2-2.5 cm. long. Leaves pinnate, 2.5-10 cm. long; petiole and rhachis jointed, the former narrowly, the latter very broadly winged; leaflets 2-4 pairs, 2.5-5 by 1.2-2.5 cm., trapezoid-ovate, obtuse, rarely acute, notched at the tip, crenulate, glabrous, base cuneate; joints of rhachis obovate-oblong, crenulate. Flowers in umbelliform, often leafy racemes; peduncles 2-3 together from the axils of fallen leaves; pedicels slender. Calyx small, glandular; lobes 4, broadly ovate, acute. Petals 4, glandular, 6 mm. long, elliptic-oblong. Stamens 8, free, subequal; filaments linear-subulate. Disk stipitiform. Ovary papillose, 4-celled; style stout. Berry 1.2 cm. diam., globose, 1-4-seeded, very acid.

Distribution: W. and S. India, Punjab, N.-W. Himalaya, Simla, Kumaon, Bihar, Bengal, Assam, Burma.—Siam, Cambodia, Laos, Yunnan.

The leaves are supposed to be a remedy for epilepsy; the root is purgative, sudorific, and employed for the cure of colic and cardialgia.

The dried fruit is tonic, diminishes intestinal fermentation, has the power of resisting the contagion of smallpox, malignant and pestilent fevers, and is also considered an excellent antidote to various poisons, on which account it is much sought for, and forms an article of commerce with Arab and other merchants (Rheede).

Lisboa states that the berry is much used as a tonic in Malabar, and that its red-coloured mucilage is considered to be an antidote against snake-bite and the poisons of other venomus animals.

The fruit is not an antidote to snake venom (Mhaskar and Caius).

Bombay: Naringi, Ranlimbu—; *Burma:* Thanatka, Thihayaza—; *Canarese:* Arunamullu, Betaruhi, Kadubela, Kadubilvapatri, Kadunimba, Nayibel, Nayibullal—; *Chota Nagpur:* Belsian—; *French:* Limonellier—; *Hindi:* Beli—; *Malayalam:* Kattunarakan, Serukattunarakan—; *Marathi:* Kawat, Naibel, Tondsha—; *Merwara:* Kara, Keiri—; *Mundari:* Belesing, Bilidsing—; *North-Western Provinces:* Bali—; *Tamil:* Billuvamaram, Kurangu, Kuttivila, Magavilvam, Nayelumichai, Nayvila—; *Telugu:* Kukkavelaga, Tollivellam, Torelaga, Tottelaga—; *Uriya:* Bhenta—.

LUVUNGA Ham.

Scandent glabrous shrubs, usually armed with axillary spines. Leaves 3-foliolate; leaflets coriaceous, quite entire. Flowers in axillary, fascicled or panicled racemes. Calyx cupular, entire or obscurely 4-6-lobed. Petals 4-5, free, thick, oblong or lanceolate, imbricate. Stamens 8-10, equal or subequal; filaments linear-subulate, free or connate below; anthers linear or linear-oblong. Disk elevated, annular or cupular. Ovary 2-4-celled; ovules 2 in each cell, superposed; style short, continuous, stout, at length deciduous; stigma capitate. Berry large, ellipsoid, with a thick rind, 1-3-seeded. Seeds large, ovoid; testa membranous, nerved; cotyledons equal, oblong, fleshy.—Species 4.—Indo-Malayan.

This genus is therapeutically inert.

1. **Luvunga scandens** Ham. in Wall. Cat. 6382; Bot. Mag. t. 4522.—PLATE 194.

A powerful scandent shrub, armed with axillary solitary strong

sharp and more or less recurved thorns, all parts glabrous. Leaves 3-foliolate, long-petioled, glabrous; leaflets lanceolate or oblong-lanceolate, shortly petioluled, more or less acuminate, entire, coriaceous, 7.5-25 cm. long. Flowers conspicuous, white, shortly pedicelled, forming glabrous cymose racemes in the axils of the leaves and above the scars of the fallen ones. Petals about 10-12 mm. long. Filaments glabrous, united into a longer or shorter tube. Berries oval, obscurely 3-lobed, the size of a pigeon's egg, rather smooth, 1-3-seeded, glabrous.

Distribution: Eastern Bengal, Assam, Khasia Hills, Chittagong, Burma, Malay Peninsula.—Cambodia, Sumatra.

The root and the berries are sweet, oily, cooling; allay thirst; aphrodisiac; cure consumption, biliousness, troubles due to "vata", blood disorders, burning, fever; aggravate "kapha" (Ayurveda).

The berries are used in preparing a perfumed medicinal oil (Kakkolaka), and are sold in the bazaars of Bengal under the name of Kakala.

The root and fruit are prescribed with other drugs for the treatment of snake-bite and scorpion-sting.

The root and fruit are equally useless in the treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

Malay: Akar Keping—; *Sanskrit:* Dhankshika, Dhira, Dhmanksholi, Jivaniya, Jivanti, Kakoli, Kayasthika, Kshira, Lavangalata, Madhura, Payasvinim Payasya, Shitapaki, Shukla, Svadumansi, Vayasoli, Vayasolika, Vayastha—.

Paramignya Wight.

Erect or climbing shrubs, unarmed or with axillary spines. Leaves 1-foliolate (the articulation often obscure), subcoriaceous, persistent. Flowers rather large, axillary, solitary or fascicled. Calyx cupular or small and 4-5-lobed. Petals 4-5, free, imbricate or very rarely induplicato-valvate. Stamens 8-10, free, equal or subequal; filaments linear; anthers linear-oblong. Disk thick, columnar. Ovary 3-5-celled; ovules 1 or 2, obliquely superposed in each cell; style elongate, continuous with the ovary, finally deciduous; stigma capitate. Berry ovoid or subglobose, often contracted at the base, 1-5-seeded;

rind thick. Seeds large, oblong, compressed; testa membranous; cotyledons fleshy, equal.—Species 6.—Indo-Malayan.

1. Flowers nearly 2.5 cm. long. Calyx cupular with broad lobes .... 1. *P. monophylla.*
2. Flowers about 13 mm. long. Calyx small with acute teeth .. 2. *P. longispina.*

The genus has little therapeutical value.

1. **Paramignya monophylla** Wight Ill. I (1840) 109.—Plate 195.

A climbing evergreen shrub, the older branches armed with sharp recurved axillary spines 1.2-2 cm. long. Leaves numerous, 1-foliolate, gland-dotted; petioles 6-12 mm. long, usually twisted; leaflets 5-10 by 2.5-6.3 cm., ovate-oblong, acute, obtuse or acuminate, entire or nearly so, glabrous, base rounded often oblique. Flowers white; pedicels axillary, 1-3 together, pubescent. Calyx softly wooly; lobes 5, shallow, rounded. Petals 5, linear-oblong, 2 cm. long, recurved. Filaments flat, linear, hairy, suddenly tapering beneath the anthers. Ovary hairy, 3-5-celled; style long, stout, the lower part hairy. Berry obovoid or ellipsoid, 2.5 cm. long, smooth. Seeds numerous, large, compressed.

Distribution: Konkan, Deccan, S. M. Country, N. Circars, W. Ghats from N. Kanara to Tinnevelly up to 6,000 ft., Ceylon, Sikkim, 2,000—5,000 ft., Bhutan, Khasia Hills, Tennasserim.

In Goa the country people use the root as an alterative tonic.

In the Konkan the root is given to cattle suffering from bloody urine, or bloody fluxes from the abdomen.

In cases of snake-bite the bruised leaves are applied to the wounds.

The leaves are useless as an external application in the treatment of snake-bite (Mhaskar and Caius).

Bombay: Karivageti, Kurvivageti—; *Canarese:* Kadukanji, Kannimbe—; *Goa:* Kariwageti, Kurwiwageti—; *Lepcha:* Jhunok—; *Marathi:* Kariwageti, Kurwawagutti, Ranyeed—; *Nepal:* Natkanta—; *Sinhalese:* Wellangiriya—.

2. **Paramignya longispina** Hook.f. Fl. Brit. Ind. I, 511.—Plate 196.

A low spiny shrub, 2-3.8 cm. long. Leaves elliptic-oblong acute or obtuse; nerves indistinct, 6.3-11.4 cm. long, 2.8-4.5 cm. wide; petioles 5 mm. long. Flowers white, 9 mm. long, axillary, solitary or 2 or 3 on a 2.5 cm. long pedicel. Calyx 5-toothed. Petals oblong-obtuse. Stamens 10, glabrous, equal; anthers as long as the filaments, apiculate. Ovary on the disk. Fruit ovoid, triquetrous, apiculate, 3-4.5 cm. long, green or brown, resinous, 3- or 4- celled. Seeds compressed, beaked.

Distribution: Sundribuns, Burma, Malay Peninsula.

In the Sundribuns the fruit is used in colic.

Malay: Liman lelang—; *Sundribuns:* Bannimbu—.

Atalantia Corr.

Shrubs or small trees, spinous or unarmed. Leaves alternate, 1-foliolate, coriaceous, persistent; stipule-like scales which belong to undeveloped leaf-buds are often present at the base of the petioles and spines. Flowers in axillary (rarely terminal) fascicles, ramcemes or panicles, rarely solitary. Calyx 3-5-lobed, or -partite, sometimes irregularly split. Petals 3-5, free or adnate to the stamens and united with them into a tube, imbricate. Stamens 6-8 (rarely 15-20), free or irregularly connate into a tube, subequal or the alternate shorter; anthers ovate-oblong or with a cordate base. Ovary 2-4- (rarely 3-5-) celled; ovules 1 or 2, collateral; style at length deciduous; stigma capitate. Berry large, subglobose, 1-5-celled, 1-5-seeded. Seeds oblong; cotyledons fleshy, plano-convex.—Species 18.—Tropical Asia, China, Australia.

A. armata Guill. and *A. monophylla* Corr. are used medicinally in Indo China.

1. **Atalantia monophylla** DC. Prodr. I (1824) 535.—*A. floribunda* Wight Ic. t. 1611.—Plate 197.

A shrub or treelet about 6 m. tall, with short sharp spines. Leaves lanceolate to ovate, tip obtuse usually notched, edges entire, base cuneate or rounded, 3-6.3 cm. long, 1.5-3.5 cm. wide; petioles 5-7.5 mm. long. Racemes or cymes about 2.5 cm. or less long,

puberulous, longer than the flowers. Flowers white, 9-12 mm. long. Calyx irregularly lobed, edges scarious. Petals oblong-obtuse. Stamens 8 or fewer, bases joined in a tube, tips free. Ovary sessile on an annular disk. Berries globose, green, 1.5-2 cm. through.

Distribution: Konkan, S. M. Country, N. Kanara, Madras Presidency: W. coast, W. Ghats, Carnatic, Deccan, N. Circars, Ceylon, Sylhet, Burma, Malay Peninsula.—Indo-China, Java (cultivated).

The berries of this yield a warm oil which is, in native medicine, considered as a valuable application in chronic rheumatism and paralysis (Ainslie).

In the Konkan, the leaf juice is an ingredient in a compound liniment used in hemiplegia.

In Ceylon the fresh leaves are bruised, mixed with salt, heated, and applied to the part bitten by a snake. It is useful especially in the bites of tree-snakes (Roberts).

The leaves are useless as an external application in the treatment of snake-bite (Mhaskar and Caius). Tree-snakes are harmless (Caius).

Canarese: Adavinimbe, Dodlihuli, Kadunimbe—; *Ceylon:* Perunkuruntu—; *Deccan:* Janglinimbu—; *Malay:* Akarmerlimau, Empenai—; *Malayalam:* Kattukurunta, Kuttunarakam, Kolanna, Malanarakam—; *Marathi:* Makadlimbu, Makurlimbu, Ranlimbu—; *Sanskrit:* Atavijambira—; *Saora:* Karunimma, Motameri—; *South Konkan:* Matangnar—; *Tagalog:* Dayapnamonti—; *Tamil:* Kattanaragam, Kattelumichai, Kattukkichili, Kattukkurundu, Kurindai, Kurundu, Perungurundu—; *Telugu:* Adavimunugudu, Adavinimma, Ettamunukudu, Karunimma, Yerramonukudu—; *Tulu:* Kaiperipuli—; *Uriya:* Katanarunga, Katonarongi, Katonorangi, Narguni—; *Visayan:* Magcabugao—.

Citrus Linn.

Trees or shrubs, usually spinous. Leaves 1-foliolate; petiole often winged; leaflets entire or creunlate, coriaceous, persistent. Flowers white or pinkish, sweet-scented, solitary, fascicled or in small cymes. Calyx cupular or urceolate, 3-5-fid. Petals 4-8, linear-

oblong, thick, imbricate. Stamens 20-60; filaments variously connate, compressed at the base; anthers oblong. Disk large, cupular or annular. Ovary many-celled; ovules 4-8 in each cell, 2-seriate; style deciduous; stigma capitate. Berry globose or oblong, fleshy, many-celled; septa membranous; cells few-seeded, filled with horizontal or fusiform cellules replete with juice. Seeds horizontal or pendulous; testa coriaceous or membranous; embryos sometimes 2 or more in 1 seed; cotyledons plano-convex, often unequal; radicle small, superior.—Spacies 10.—Paleotropical and subtropical regions.

A. Young shoots and leaves glabrous; transverse vesicles of pulp concrete
  I. Young shoots purple. Petals tinged with red. Flowers often unisexual. Fruit often mammillate at the apex ... 1. *C. medica.*
  II. Young shoots greenish white. Petals white. Flowers bisexual. Fruit not mammillate .... 2. *C. aurantium.*
B. Young shoots and under side of leaves pubescent; transverse vesicles of pulp distinct .... 3. *C. maxima.*

The genus is noted for its stomachic and stimulant properties.

The following are used medicinally in Europe—*C. aurantium* Linn., *C. bigaradia* Duham., *C. limetta* DC., *C. limonum* DC., *C. medica* Linn.—; in Persia—*C. cedra* Gall.—; in China—*C. aurontium* Linn., *C. grandis* Osbeck, *C. japonica*, Thunb., *C. maxima* Merrill, *C. medica* Linn., *C. trifoliata* Linn.—; in Indo China—*C. aurantium* Linn., *C. bigaradia* Duham., *C. hystrix* DC., *C. japonica* Thunb., *C. maxima* Merrill, *C. medica* Linn.—; in the Philippine Islands—*C. acida* Roxb., *C. aurantium* Linn., *C. hystrix* DC., *C. maxima* Merrill, *C. medica* Linn., *C. toroso* Blanco—; in the Gold Coast—*C. medica* Linn.—; in Brazil—*C. aurantium* Linn., *C. limetta* DC., *C. limonum* DC., *C. maxima* Merrill, *C. medica* Linn.—; in Madagascar—*C. vangasay* Bojer.—; in South Africa—*C. aurantium* Linn.—.

OFFICIAL:—*Citrus spp.* (Holland, Japan, Portugal, Turkey)—flower, fruit, and essential oil.

The pericarp of *C. aurantium* Linne (Great Britain, United States), *C. Aurantium* Risso (France, Spain); the flowers of *C. Aurantium*—var. *amara* Linne (United States); the flower, leaf, and pericarp of *C. Aurantium* Linne var. *amara* Linne (Spain), the

pericarp (Germany, Hungary, Turkey); the fruit of *C. Aurantium* Linn. subsp. *amara* Engl. (Japan); the flower and fruit of *C. Aurantium* Linn. subspecies *amera* Linn. (Sweden); the leaf, flower, pericarp of *C. Aurantium* Linn. subsp. *amara* Linn. (Austria)=*Citrus vulgaris* Risso (Switzerland); the leaf, flower, and pericarp of *C. Aurantium* Linn. var. *amara* Linn.=*C. Bigaradia* Risso (Italy); the essential oil from *C. Aurantium* Linne var. *Bergamia* (Turkey), *C. Aurantium* Linn. subsp. *Bergamia* (Risso and Poiteau) Wight and Arnott (Russia, Switzerland); the unripe fruit of *C. Aurantium* Linn. var. *Bigaradia* (Norway); the leaf, flower, and pericarp of *C. Aurantium* var. *Bigaradia* Hook. fil. (Belgium); the pericarp of and essential oil from *C. Aurantium* var. *senensis* Linne (United States); the flowers and fruit of *C. Aurantium* Risso var. *sinense*=*Aurantium Olyssiponense* Tournefort, var. *Lusitanicum* and others (Portugal).

The essential oil from *C. Bergamia* Risso (Belgium, France), *C. Bergamia* Risso and Poiteau (Japan, Spain), *C. Bergamia* var. *vulgaris* Risso (Portugal).

The leaves, flowers, fruit, and pericarp of *C. Bigaradia* Duham. =*C. vulgaris* Risso var. *hispanica* and others (Portugal).

The fruit of *C. Limonum* Risso (Denmark, France, Italy, Portugal); the pericarp of *C. Limonum* (Risso) Hook. fil. (Hungary), *C. Limonum* Risso var. *hispanicum* var. *vulgaris* and others (Portugal); the outer part of the fresh pericarp of *C. Limonia* Osbeck (Great Britain).

The fruit of *C. medica* Linne (Japan, Spain), the pericarp (Turkey), the essential oil (Germany, Spain, Turkey); the fruit of *C. medica* Risso (Italy, Spain); the essential oil from *C. medica* Linn. var *β-Limonum* Hook. fil. (Belgium), *C. medica* var. *Limonum* (Risso) Hooker filius (Russia, United States); the fruit of *C. medica* Linn. subspecies *limonum* Hooker fil. (Japan, Sweden); the pericarp of and essential oil from *C. medica* Linn. subsp. *Limonum* (Risso) Hooker fil.=*C. Limonum* Risso (Switzerland).

The leaf, fruit, and flower of *C. vulgaris* Risso (Denmark, France, Russia).

1. **Citrus medica** Linn. Sp. Pl. (1753) 782.—PLATE 198.

An evergreen shrub, 1.8-3.6 m. high with stems up to 10 cm. diam. Young shoots glabrous. Bark smooth, yellowish brown. Blaze 2.5 mm., pale orange or pale yellow. Branches up to about 5 cm. diam. armed with sharp, stout, straight, axillary thorns up to 7.5 cm. long. The branches often procumbent, and rooting freely in contact with the ground. Leaves 7.5-15 by 3-7.5 cm., oblong or elliptic with acute or rounded apex, rather obscurely crenate-serrate, coriaceous, glabrous, pellucid-punctate, dull dark green above. Petiole 5-12 mm. long, sometimes very narrowly winged. Flowers 3.8-4.5 cm. diam., scented, white tinged pink outside, often unisexual, in few-flowered axillary cymes up to 2.5 cm. long, or solitary. Pedicels 3.8-6 mm. long. Fruit 5-7.5 cm. long, usually obovoid, yellow when ripe, with a leathery rind.

Distribution: Found apparently wild in Kumaon, Pachmarhi (C. P.), Sikkim, Garo Hills, Khasia Hills, Chittagong, Upper Yunzalin valley, E. Dun, Satpura Hills, W. Ghats.

Var. 1. **Citrus medica proper.**—The Citron.

Fruit large, oblong, obovoid or somewhat irregularly shaped; mamilla obtuse; rind thick, very aromatic; pulp scanty, subacid.

The root is anthelmintic; used in constipation and in tumours; removes colic; useful in vomiting, urinary calculus, and caries of the teeth.—The buds and flowers are stimulant, astringent to the bowels; increase appetite; relieve vomiting; useful in tumours, abdominal complaints, asthma, cough, hiccough, intoxication.—The unripe fruit increases "vata", "pitta", "kapha", and disturbs the blood.—The ripe fruit is sweet and sour; stimulant, digestible, tonic; cures leprosy; relieves sore throat, cough, asthma, thirst, hiccough; good for the throat; the juice allays earache.—The rind of the fruit is bitter, sharp, oily; aphrodisiac; removes "vata" and "kapha". —The seeds are indigestible, heavy, heating to the body; stimulant, tonic; good for piles and in biliousness; cure inflammations and "kapha" (Ayurveda).

Citron rind is hot, dry, and tonic; the pulp cold and dry; the seeds, leaves and flowers hot and dry; the juice refrigerant and astringent. According to Theophrastus, the fruit is an expellent of poisons. It also corrects fetid breath.

The distilled water of the fruit is used as a sedative.

The rind is made into a marmalade and is an antiscorbutic. It is made into a preserve and is used for dysentery.

Either alone or in combination with other drugs, the bark, leaves, and fruit are prescribed in snake-bite (Sushruta, Vagbhata, Yogaratnakara, Ayurvedaprakasha, Charaka, Sharangdharsamhita). The root and fruit are recommended for the treatment of scorpion sting (Charaka, Vagbhata, Sushruta, Yogaratnakara, Brihannighantaratnakara, Nighantaratnakara).

No part of the plant is an antidote to snake (Mhaskar and Caius) or scorpion venom (Caius and Mhaskar).

δ-limonene and citral occur in the oil from the peel. The fruit contains the glucoside hesperidin.

Arabic: Utraj, Utrej Utroj, Uturinji—; *Bengal:* Bara nimbu, Begpura, Bijaura, Honsa nebu, Lebu, Nebu, Turanj—; *Betsimisaraka:* Voamandina, Voasarimandina—; *Bombay:* Bijapura, Bijori, Limu, Mahalunga—; *Burma:* Shauktakera, Shontakhava, Shoutakhava, Shouktakwoh—; *Canarese:* Madala, Mahaphala, Rusaka—; *Catalan:* Punseme—; *Chinese:* Chu Yuan—; *Deccan:* Turanj—; *Dutch:* Citroenboom, Limoenboom—; *English:* Adam's Apple, Cedrat, Citron, Melon Lime—; *French:* Cédratier, Citronnier—; *German:* Cedraten, Citrone, Zitronenbaum—; *Greek:* Kitrea, Kitria—; *Gujarat:* Balank, Bijoru, Turanj—; *Hindi:* Bara nimbu, Bijaura, Kutla, Limbu, Nimbu, Turanj—; *Italian:* Cederno, Cedrato, Cedro—; *Konkani:* Mauling—; *Kotra:* Turanj—; *Lepcha:* Kachikung—; *Mach:* Turin—; *Madagascar:* Voasary—; *Madras:* Narottei—; *Malayalam:* Gilam, Matalanarakam, Rusakam, Sholangam—; *Malta:* Citron, Cedrato, Cedro, Citrat, Xcomb—; *Marathi:* Limbu, Mahalunga, Mavalung—; *Nasirabad:* Turanj—; *Nepal:* Bimbiri—; *Persian:* Ruranj—; *Philippines:* Limon—; *Polish:* Cytryna—; *Portuguese:* Cidreiro—; *Punjab:* Bajauri, Nimbu—; *Rindli:* Turin—; *Roumanian:* Chitra, Lamain—; *Russian:* Limonnow dyerevo—; *Sanskrit:* Amlakeshara, Begapura, Bijaka, Bijaphalaka, Bijapur, Bijapurna, Danturachhada, Jantughna, Madhuramphala, Mahaphala, Matulunga, Phalapura, Phalapuraka, Rochanaphala, Ruchaka, Sukeshar, Supura, Vijapura—; *Sinhalese:* Sedaran, Sidran—; *Sokoto:* Lemun

magajuja, Lemun Masar, Lemun Yan sariki—; *Spanish:* Cidra, Limon—; *Swedish:* Citron—; *Tagalog:* Buyag, Calamondin—; *Tamil:* Kogilacham, Kommattimadalai, Maruchagam, Sidalai—; *Telugu:* Lungamu—; *Tulu:* Mapala—; *Visayan:* Dalayap—.

Var. 2. **Limonum.**—The Lemon.—PLATE 199B.

Petiole margined or winged. Fruit ovoid, yellow, mammillate; rind thin; pulp abundant, very acid.

The rind of the fruit is sour, heating, with a sharp taste; anthelmintic; removes "vata", "kapha", and lung troubles (Ayurveda).

The rind of the ripe fruit is stomachic and carminative. The oil mixed with glycerine is applied to the eruption of acne.

The juice of the ripe fruit is a valuable antiscorbutic and refrigerant.

In scurvy, it is one of the best remedies we possess, both as a prophylactic and as a curative. In febrile and inflammatory affections, the diluted juice, sweetened, forms an excellent refrigerant drink. In acute rheumatism and rheumatic gout, in some forms of acute tropical dysentery and diarrhœa, etc., it has been successfully employed. As an antidote to some acro-narcotic poisons, it often proves effectual. Lemon juice and gun powder used topically for scabies.

The bark of the root has been used in the West Indies as a febrifuge and the seeds as a vermifuge.

Geraniol, 1-linalool, and citral occur in the oil from the peels. The fruit contains the glucosides hesperidin.

Arabic: Qalambak—; *Bengal:* Baranebu, Goranebu, Karnanebu—; *Betsimisaraka:* Voasarimandina—; *Burma:* Kigisamyasi—; *Canarese:* Bijapura, Bijori, Devamadala, Doddanimbe, Gajanimbe, Harale, Iliminje, Madala, Matulunga, Toranji—; *Ceylon:* Kidanarattankai—; *Danish:* Citron—; *Deccan:* Baranimbu, Jambira, Paharikaghzi, Paharinimbu—; *Dutch:* Citroenboom—; *English:* Lemon—; *Ewe:* Anguti—; *French:* Citronnier, Limonier—; *German:* Citrone, Limone—; *Gujarat:* Metalimbu,

Motulimbu, Motunimbu—; *Hindi:* Baranimbu, Jambira, Paharikaghzi, Paharinimbu—; *Hungarian:* Citrom—; *Italian:* Limone—; *Krobo:* Afukpairtair—; *Madagascar:* Voasary—; *Malayalam:* Ganapatinarakam, Matalam, Matalunkam, Valiyacerunarakam, Vallinarakam—; *Malta:* Lemon, Limone, Lumi—; *Marathi:* Idalimbu, Thoralimbu—; *Nasirabad:* Lema, Lembu—; *Persian:* Kalimbak—; *Portuguese:* Limoeiro—; *Punjab:* Gulgul, Khutta, Kimti—; *Roumanian:* Lamain—; *Russian:* Limonnoe dyerevo—; *Sanskrit:* Mahanimbu, Matalunga, Matunga, Vanabijapura—; *Sinhalese:* Lokkadehi, Natram—; *Spanish:* Limonero—; *Swedish:* Citron—; *Tamil:* Kodaiyelumichai, Kodimadalai, Kudamarattai, Madulam, Madulungam, Murukku, Periyilamichai, Sadabalam, Turinji—; *Telugu:* Bijapuram, Gajanimma, Madiphalamu, Matalungakamu, Matulungamu, Peddarimma, Pulladabba, Naradabba—; *Tigrinia:* Narige—; *Turkish:* Limon—; *Twi:* Guare ansra—; *Uriya:* Bijapura, Gojjonimbo—.

Var. 3. **Acida.**—The Sour Lime of India.

Leaflets elliptic-oblong. Racemes short; flowers small; petals usually 4. Fruit usually small, globose or ovoid; rind thick or thin; pulp pale, very acid.

The fruit has a sour sharp taste; appetiser, stomachic, anthelmintic; cures abdominal complaints; removes diseases due to "tridosha," loss of appetite, constipation, fatigue; good in "kapha" and biliousness, abdominal pain, and foul breath; relieves vomiting; good for the eyes (Ayurveda).

The fruit has a sour and sharp taste, with flavour; stimulant; useful in weakness and trembling of the limbs, hemicrania, throat troubles, brain disorders, plethora; relieves biliousness, burning in the chest, vomiting, retching, bronchitis; improves liver, heart, eyes; not good in old age.—The leaves are used for bleeding of the gums (Yunani).

Native practitioners consider lime-juice to have virtues in checking bilious vomiting, and believe that it is powerfully refrigerant and antiseptic (Ainslie).

Arabic: Limun—; *Bengal:* Camralnebu, Kaghzinimbu, Kagu-

jinebu, Lebu, Limbu, Nebu, Nimbu, Patinebu, Tabanebu—; *Burma:* Saniyasi, Tambiyasi, Thanbaya—; *Canarese:* Limbe, Nimbe—; *Ceylon:* Dhaisikai—; *Deccan:* Limu, Limun, Nibu, Nimbe, Nimbu—; *English:* Acid Lime, Sour Lime—; *Ewe:* Anguti—; *Fanti:* Ankama—; *Ga:* Abonua—; *Gujarat:* Khatalimbu, Lebu, Limbu, Nimbu—; *Hausa Hindi:* Lebu, Limbu, Limu, Limun, Nebu, Nibu, Nimbu—; *Indo China:* Chanh sac, Chi, Chi sac, Chuc, Kroch tich—; *Krepi:* Mumore—; *Krobo:* Krairtair—; *Malayalam:* Dantahashkam, Dantasanam, Dantasatham, Erumichinarakam, Narakam, Serunarakam—; *Marathi:* Limbu—; *Persian:* Limu, Limuctursh, Limun—; *Portuguese:* Limoeiro—; *Punjab:* Kuttanimbu, Nimbu—; *Sanskrit:* Amlajambir, Amlasara, Dantaghata, Jambira, Jantumari, Limpaka, Nimbuka, Rochana, Shodhana, Vanhibija, Vanhidipya, Vijapura—; *Sinhalese:* Dehi—; *Tagalog:* Dayap—; *Tamil:* Ambu, Ambuvagini, Arunam, Elumichai, Iligusam, Murukku—; *Telugu:* Nimma—; *Tulu:* Nimbepuli—; *Twi:* Akenkaa, Ankaa—; *Urdu:* Limunkaghzi—; *Uriya:* Kagojilembu, Lembu, Nimbu—.

Var. 4. **Limetta.**—The Sweet Lime of India.

Fruit globose, 7.5-12.5 cm. diam; rind thin, smooth, adhering to the pulp, juice abundant, sweet, not aromatic.

The fruit is cooling; causes "kapha", removes "vata" and biliousness (Ayurveda).

The fruit is sweet and has flavour; good in thirst, fever, biliousness, brain troubles, tendency to haemorrhage.—The rind is anthelmintic; useful in vomiting.—The seeds are bitter with a bad taste; astringent to the bowels, cooling; strengthen the gums and the teeth; arrest vomiting and retching (Yunani).

The fruit is extensively used as a refrigerant in fever and jaundice.

d-limonene, linalool, methylnonylketone, and the glucoside hesperidin occur in the leaves and fruits.

Arabic: Limunalhava—; *Bengal:* Mithanebu—; *Bombay:* Mithalimbu—; *Brazil:* Limeira—; *Burma:* Thanbaya—; *Canarese:* Gajanimbe, Imbe—; *English:* Limetta, Sweet Lime—; *French:* Bergamotier, Lime douce, Limettier, Limonier a fruits doux—;

Gujarat: Mithalimbu—; *Hindi:* Mithaamritphal, Mithanebu, Mithanimun, Nimbu—; *Malayalam:* Erimichinarakam—; *Malta:* Lime, Limone bergamotto, Pomo d'Adamo, Lumicell, Lumi ta bla zerrigha—; *Persian:* Limunshirin—; *Portuguese:* Limeira—; *Punjab:* Mithanimbu—; *Roumanian:* Pergamuta—; *Russian:* Bergamotnoedyerevo—; *Sanskrit:* Madhukukutika—; *Sinhalese:* Dehi—; *Spanish:* Bergamota, Lima, Limon dulce—; *Tamil:* Elumicham—; *Telugu:* Gajanimma, Nenumapandu—; *Urdu:* Limunshirin—.

2. **Citrus aurantium** Linn. Sp. Pl. (1753) 782.—The Bitter and Sweet Orange.—PLATE 199A.

A tree, rarely a shrub; young shoots glabrous, greenish white. Leaves 1-foliolate; leaflets 7.5-15 cm. long, elliptic or ovate, obtuse, acute or acuminate; petioles naked or winged, the wing often obovate and nearly as large as the blade. Flowers bisexual, pure white. Stamens 20-30. Fruit globose, generally oblate, not mamillate, usually orange-coloured; rind loose or adherent; pulp sweet, yellow, rarely red.

Distribution: Widely cultivated in India.—Said to be indigenous in the Mothronwala Swamp Dehra Dun, Garhwal, Kumaon, Sikkim, Khasia Hills, Manipur, mountain forests of the Peninsula.

Var. 1. **Citrus aurantium proper.**—*C. aurantium* Risso et Poiteau.—The Sweet Orange.

Petiole naked or winged; pulp sweet, yellow, sometimes red, in a loose or adhering rind.

The unripe fruit is strengthening; cardiotonic, laxative, anthelmintic; removes fatigue.—The ripe fruit has flavour; difficult to digest; sweet and slightly sour; laxative, aphrodisiac; removes "vata"; causes "kapha" and "pitta" (Ayurveda).

The flower is stimulant; its smell relieves colds; its decoction is good in fevers; its juice is tonic, diuretic, useful in piles, enlargement of the spleen, chest troubles, and lumbago.—The fruit is sour, and sweet, and has flavour; cooling, aphrodisiac, astringent to the bowels, tonic to the liver; relieves vomiting and retching; removes biliousness; fortifies the chest.—The rind is anthelmintic; good in vomiting and in skin diseases; its juice stops bilious diarrhoea (Yunani).

In Cambodia the leaves are considered pectoral and are given for bronchitis.

The water distilled from orange flowers is employed, in one or two fluid ounces, as an antispasmodic and sedative in nervous and hysterical cases.

Orange poultice is recommended in some skin affections, such as psoriasis, &c. Oranges are considered to be alexipharmic and disinfectant; orange-water stimulating and refreshing. The essence extracted by oil from the rind and flowers is used as a stimulating liniment.

The peel is useful for checking vomiting, and the prevention of intestinal worms.

The dried outer portion of the rind of the fruit possesses stomachic and tonic properties. It is useful in atonic dyspepsia, and general debility.

d-linalool occurs in the oil from the rind of the fruit. The fruit contains the glucoside hesperidin.

Arabic: Naranj, Narendibolu—; *Awuna:* Atortornguti—; *Bengal:* Kamlanembu, Narenga, Narungi—; *Bombay:* Naranghicantra, Narangi, Naringi, Naringsala—; *Burma:* Liengman, Shonsi, Shoungpan, Sunguen, Thanbaya—; *Cambodia:* Krauch—; *Canarese:* Doddile, Herula, Ile, Kittile, Nadeyi, Naranga, Sakkarekanji, Satagadi—; *Catalan:* Taronge dols—; *Ceylon:* Narankai—; *Chinese:* Ch'eng, Kuang Chu, Yu—; *Danish:* Pomeranstroee—; *Deccan:* Naringhie, Orangen—; *Dutch:* Oranjeboom—; *English:* China Orange, Orange Tree, Portugal Orange, Sweet Orange—; *Ewe:* Akutu, Atortornguti—; *French:* Oranger—; *German:* Apfelsine, Orangenbaum, Pomerangenbaum, Suesser Pomeranzenbaum—; *Greek:* Portogalli, Portokalli—; *Gujarat:* Narangi, Naringi—; *Hausa:* Babban lemu, Lemun Maka—; *Hindi:* Amritphal, Qumlanebu, Narangi, Narenj, Naringi, Narunge, Sangtara, Sunthura—; *Hova:* Laorangy—; *Hungarian:* Narancs—; *Italian:* Arancio, Arancio delce, Melarancino, Portogallo—; *Konkani:* Laranj—; *Kotra:* Naranj—; *Krepi:* Atortornguti—; *Krobo:* Akutu—; *Lepcha:* Silumkung—; *Madras:* Kichili—; *Malaya:* Kor phee—; *Malayalam:* Madhuranaranna, Naranna—; *Malta:* Mandarine orange, Mandarino, Mandurina—;

Marathi: Naringa, Narungasala, Sakulimba—; *Mysore:* Jeruc, Simaomanis—; *Nepal:* Suntale—; *Persian:* Narang, Narendj—; *Philippines:* Cagel—; *Polish:* Pomerancza drzevo—; *Portuguese:* Larangeira, Larangeira de fructo dolce—; *Punjab:* Narangi, Naranj, Naringi, Santara—; *Roumanian:* Portocal—; *Russian:* Apelsinnoi dyerevo, Pomerantsevoi dyerevo—; *Sanskrit:* Airavata, Chakradhivasi, Gandhadhya, Gandhapatra, Kirmira, Kirmirtvaka, Mahanarama, Mukhapriya, Nagar, Nagaranga, Nagruka, Naranga, Nariyanga, Suranga, Svadunaranga, Tvagagandha, Tvakasugandha, Vaktravasa, Varishtha, Yogaranga—; *Sinhalese:* Dodan, Dodang, Narangka, Pannehdodang, Penidodan—; *Spanish:* Naranjo, Naranjo dulce—; *Swedish:* Pomeranstroed—; *Tagalog:* Calamanse, Cahel, Dalandan, Narangitas, Pisong, Sintonis—; *Tamil:* Narangam, Pattaviya, Pandil, Puttansini, Sadagadi, Sini—; *Telugu:* Battavinarinja, Buddasini, Ida, Narangamu, Naranji, Narinja, Peddayida, Satghadi, Sini—; *Tiagan:* Cabulao—; *Turkish:* Narinsh, Portakal, Turunj—; *Twi:* Akutu, Abrornkaa—; *Urdu:* Narangi—; *Uriya:* Nagorongo, Narongi, Narongo—; *Visayan:* Cahel, Narangitas—.

Var. 2. **Bigaradia.**—*C. Bigaradia* Risso et Poiteau.—The Bitter or Seville Orange.

Petiole generally winged; flowers larger and more strongly scented than those of the Sweet Orange; rind of fruit very aromatic; pulp not sweet, bitter or austere.

The fruit is sour, acrid, bitter; hot, laxative, stomachic; removes biliousness and "kapha" (Ayurveda).

The fruit is an aromatic bitter.

d-limonene, geraniol, and methyl anthranilate occur in the oil from the flowers.

The oil from the fruits and the oil from the pips have been studied by Sanjiva Rao, Sudborough, and Watson (*Journ. Ind. Inst. Sc.*, 1925).

Canarese: Kanji—; *Catalan:* Taronye agre—; *English:* Bigarade Orange, Bitter Orange, Seville Orange—; *French:* Bigaradier, Oranger amer—; *German:* Bittere Orange, Pomeranze—; *Indo China:* Quit hoi, Su dang—; *Italian:* Arancio amaro, Arancio forte—;

Malayalam: Karna—; *Malta:* Bitter Orange, Seville Orange, Arancio forte, Melangolo, Laringa Karsa, Zupperit—; *Mexico:* Naranjo agrio—; *Norway:* Umoden Pomerans—; *Roumanian:* Naramz—; *Sanskrit:* Brihatjambhira, Nagaranga—; *Spanish:* Naranjo agrio—; *Tamil:* Kadarai, Kadanarttai, Nandam, Narangam, Narandam, Narattai—; *Telugu:* Mallikanarangi—; *Uriya:* Nagorongo, Narongi, Narongo—.

Var. 3. **Bergamia.**—*C. Bergamia* Risso et Poiteau.—The Bergamot.

Flowers small, very sweet-scented; fruit pear-shaped or globose; rind smooth, pale yellow; pulp acidulous, with a pleasant aroma.

The leaves are anthelmintic, stomachic, appetising; remove "vata", "kapha", and bad taste in the mouth.—The unripe fruit is very sour and sweet, with flavour; digestive, tonic, appetiser, anthelmintic; causes biliousness; removes troubles due to "vata" and "kapha"; allays thirst, vomiting, bad taste in the mouth, and heart troubles.—The ripe fruit is sweet; aphrodisiac; removes "kapha", and leprosy; its juice in the ear stops earache (Ayurveda).

The juice of the fruit is useful as a cooling drink in small-pox, measles, scarlatina, and other forms of fever. It may also be taken with advantage in cases of haemorrhage from the lungs, stomach, bowels, uterus, kidneys, and other internal organs (Waring).

The oil from the rind contains linalool.

Arabic: Limu, Limue-hamiz—; *Bengal:* Nebu—; *Burma:* Lamya-si, Tam-buyu-si—; *Canarese:* Jambha, Limbe, Nimbe—; *Deccan:* Limu, Limun, Nibu—; *English:* Bergamotte Orange—; *French:* Bergamotier—; *Gujerati:* Limbu, Nimbu—; *Hindi:* Limu, Limun, Nibu—; *Italian:* Bergamotto—; *Malayalam:* Jambhalam, Jambham, Sonakanarakam, Serunarakam—; *Malta:* Bergamot, Bergamotto, Bergamotta—; *Marathi:* Limbu—; *Mexico:* Bergamota—; *Persian:* Limeh, Limu, Limuetursh—; *Roumanian:* Pergamuta—; *Russian:* Bergamotnoi dyerevo—; *Sanskrit:* Dantaharshana, Dantakarshana, Dantashatha, Jadyari, Jambha, Jambhaka, Jambhala, Jambhara, Jambir, Jantujita, Mukashodhi, Nimbuka, Rewatavakrashodhi, Rochanaka—; *Sind:* Limu—; *Sinhalese:* Dehi—; *Tamil:*

Elumichai, Sambalam, Samiranam, Sidalam—; *Telugu:* Jambhalamu, Jambhamu, Narangamu, Narinja, Naranji—; *Tulu:* Limbe—; *Turkish:* Bergamot—; *Uriya:* Jombha, Jombhalo—.

3. **Citrus maxima** Merrill Interpr. Herb. Amb. (1917) 296.—*Aurantium maximum* Burm. Auct. Herb. Amb. (1755) 16.—*Citrus decumana* Murr. Syst. ed. 13 (1774) 580.—The Pommelo or Shaddok.

A tree 9-12 m. high; young shoots pubescent. Leaflets large, 15-23 cm. long, ovate-oblong, frequently emarginate, pubescent beneath; petioles broadly winged. Flowers large, white. Stamens 16-24. Fruit large, pale yellow, globose or pyriform; rind thick; pulp varying in colour from crimson to pale pink or yellow; vesicles distinct.

Distribution: A native of Malayan and Polynesian Islands. Largely cultivated in India.

The fruit is sweet with a flavour; nutritive, refrigerant; good in leprosy, consumption, asthma, cough, hiccough, mental aberrations, and epilepsy (Ayurveda).

The fruit is sour and sweetish; nutritive, cardiotonic; useful in biliousness and plethora; allays thirst; good for chest complaints.—The rind is anthelmintic; brain tonic; useful in vomiting, griping of abdomen, diarrhoea, headache, and eye troubles (Yunani).

The fruit is nutritive and refrigerant. It contains sugar and citric acid, with much essential oil in the peel. The leaves are said to be useful in epilepsy, chorea and convulsive cough.

In Brazil, a gum which exudes in quantity from this tree when it begins to decay, probably in consequence of the attack of insects, is used as a remedy for coughs.

The outer part of the rind is bitter and aromatic and makes an excellent cordial, also employed in China and Malaya in dyspepsia and cough. The seeds or pips have similar properties, and are sometimes given in lumbago.

Bengal: Batavinebu, Batornebu, Chakotra, Mahanimbu—; *Bombay:* Papanass, Papnass—; *Burma:* Shanktones, Shouhtonoh—; *Canarese:* Chakotre, Sakkota—; *Ceylon:* Bambalinas, Jamblica—; *Chinese:* Yu—; *Dutch:* Pompelmoies—; *English:* Forbidden Fruit,

Grape Fruit, Paradise-apple, Pomelo, Pommel-moose, Pompelmos, Shaddock—; *French:* Oranger Pompelmous, Pamplemoussier—; *German:* Pompelmus—; *Gujarat:* Obakotru—; *Hindi:* Batavinebu, Chakotra, Mahanibu, Sadaphal—; *Hova:* Papelimosy, Voasarihangibe, Voasaribe—; *Indo China:* Buoi, Chu loan, Kam tel, Krauch thlong—; *Italian:* Arancio maggiore, Pompelmo—; *Konkani:* Toranj—; *Lepcha:* Sangatrani—; *Madras:* Pompalimas—; *Malaya:* Yam vat—; *Malayalam:* Bambitinarakam, Pamparamasam—; *Malta:* Grape-fruit, Shaddock, Arancio maggiore, Xaddock, Laring ta Olanda, Laring tar-Rjus—; *Marathi:* Panis, Papnasa—; *Mundari:* Dambhadaru—; *Mysore:* Pumplemus—; *Nasirabad:* Chakotra, Papnas—; *Nepal:* Sangkatra—; *Persian:* Chakutrah—; *Portuguese:* Toranja—; *Punjab:* Chakotra—; *Russian:* Bolshoy Apelsin, Sheddock—; *Sadani:* Dambha—; *Sakalave:* Trema, Tremo—; *Sanskrit:* Madhukarkati—; *Saora:* Pampalamasi—; *Sind:* Bijoro—; *Sinhalese:* Jambula, Mahamaram, Mahanaram—; *Spanish:* Pompelmos—; *Tagalog:* Lucban, Naranja—; *Tamil:* Pambalimasu—; *Telugu:* Pampalamasam, Pampampanasa, Pampara—; *Uraon:* Dambha—; *Urdu:* Chakutrah—; *Uriya:* Batabilembu, Pompolomaso—; *Visayan:* Cabugao—.

FERONIA Corr.

Species 1.—Indo-Malayan.

Feronia elephantum Corr. is used medicinally in Cambodia.

1. **Feronia elephantum** Corr. in Trans. Linn. Soc. V (1800) 225; Roxb. Corom. Pl. t. 141; Wight Ic. t. 15; Bedd. Fl. Sylv. t. 121.—PLATE 200.

A moderate-sized tree with straight sharp strong spines 1.2-3.7 cm. long. Leaves smelling of aniseed, alternate, imparipinnate; petiole and rhachis flat, often narrowly winged; leaflets 3-9, opposite, 2.5-5 by 1.2-2.5 cm., cuneate or obovate, tip often crenulate. Flowers small, numerous, dull red, in lateral or terminal pubescent panicles, male and female flowers often in the same panicle. Calyx small, 5-6-lobed; lobes triangular. Petals 5-6, free, elliptic-oblong, 5 mm. long, spreading or deflexed. Stamens 10-12, 1-seriate; filaments equal, subulate, densely hairy at the base within; anthers large, linear-

oblong. Ovary glabrous sessile. Fruit 5-6.3 cm. diam., globose, hard; pericarp woody, rough, grey-coloured. Seeds embedded in an edible pulp.

Distribution: Indigenous in S. India, Ceylon, Java.—Cultivated in many parts of India.

The fruit is sour, sweet, acrid, with flavour and taste; difficult to digest; refrigerant, aphrodisiac, alexipharmic; cures cough, dysentery, heart diseases, vomiting; removes biliousness, "vata", "tridosha", and blood impurities, fatigue, thirst, hiccough; good for throat, asthma, consumption, tumours, ophthalmia, leucorrhœa, the juice put in the ear cures earache.—The unripe fruit is alexipharmic, astringent to the bowels; removes itching of the body; increases "vata", "pitta", and "kapha".—The seeds cure heart diseases, headache; an antidote to poisons; the oil is acrid; astringent, alexiteric; stops hiccough and vomiting; cures rat bite and all poisonings; destroys biliousness. The flowers are an antidote to poisons.—The leaves are good for vomiting, hiccough, and dysentery (Ayurveda).

The fruit is sour, sweet; refrigerant, cardiotonic, tonic to the liver and the lungs, astringent and binding, diuretic; strengthening the gums; the juice is good for stomatitis and sore throat; useful in biliousness; topically it relieves the pain due to stings of wasps and other insects.—The leaves are very astringent (Yunani).

The fruit is aromatic and used as a stomachic and stimulant in diseases of children.

The unripe fruit is described as astringent, and is used in combination with *bela* and other medicines in diarrhœa and dysentery. The ripe fruit is said to be useful in hiccough and affections of the throat.

The pulp, applied externally, is a remedy for the bites of venomous insects; if not obtainable, the powdered rind may be used.

The bark is occasionally prescribed for biliousness.

The leaves are aromatic and carminative, and are prescribed in the indigestions and slight bowel affections of children.

The fruit, root, bark, and leaf are prescribed in the treatment

of snake-bite (Charaka, Sushruta, Vagbhata). The fruit is recommended in scorpion-sting (Charaka, Sushruta).

In Cambodia, the thorns are used as a styptic in metorrhagia, the bark is a remedy for the bites and stings of venomous insects.

No part of the plant is an antidote to snake venom (Mhaskar and Caius). The fruit is useless in the treatment of scorpion sting (Caius and Mhaskar).

Annam: Can thau—; *Arabic:* Kabit—; *Bengal:* Kait, Kaṭbel—; *Berar:* Kabit—; *Bombay:* Kavit, Kowit—; *Burma:* Hman, Mahan, Thibin—; *Cambodia:* Keassang—; *Canarese:* Bela, Belada, Belala, Byala, Dadhiphala, Danthasatha, Graha, Kapittha, Malura, Manmadha, Pushpaphala—; *Ceylon:* Meladikurundu—; *English:* Curd Fruit, Elephant Apple, Monkey Fruit, Wood Apple—; *French:* Citron des Mois, Pomme de bois, Pomme d'éléphant—; *Gujarat:* Kavit, Kotha, Kothi, Kothun—; *Hindi:* Bilin, Kait, Katbel, Kavitha, Kobitha—; *Indo China:* Can thang, Kra san, Mak khi hat—; *Konkani:* Kavit, Thana—; *Lambadi:* Kottundaro—; *Madura:* Vellam—; *Malayalam:* Dadhimpham, Dadhiphala, Kapittham, Manmatham, Vilannu, Vilavu,—; *Marathi:* Kauth, Kavatha, Kavith, Kovit—; *Mundari:* Daitidaru—; *North-Western Provinces:* Kyth—; *Persian:* Kabit—; *Porebunder:* Katha, Kotha—; *Portuguese:* Balong—; *Punjab:* Bilin, Kait—; *Rajputana:* Keiri—; *Sadani:* Daintphar—; *Sanskrit:* Akshasasya, Bhukapittha, Chirpaki, Dadhiphala, Dadhittha, Dantaphala, Dantashatha, Devapadadhya, Gandhaphala, Gopakarna, Grahi, Grahiphala, Granthiphala, Kagittha, Kapipriya, Kapishtha, Kapittha, Karanjaphalaka, Kasabhavallabha, Kathinyaphala, Kavittha, Kuchaphala, Malura, Mangalya, Manmatha, Nilamallika, Phalasugandha, Pushpaphala—; *Santal:* Kainta, Kochbel—; *Sind:* Katori, Kavatha—; *Sinhalese:* Divul—; *Tamil:* Kabittam, Karuvila, Kuttvila, Narivila, Pitavila, Savarilottiram, Silangam, Sirittam, Suppiyam, Suvarasam, Suvedegam, Tilavagam, Ubalottiram, Vellil, Vellilottiram, Vila, Vilakkabittam—; *Telugu:* Kapitthamu, Pushpaphalamu, Velaga—; *Tulu:* Bela—; *Urdu:* Kaitha—; *Uriya:* Koitho, Koithobelo—; *Visayan:* Pamunoan, Ponoan—.

AEGLE Corr.

Trees, armed with spines. Leaves alternate, 3-foliolate. Flowers hermaphrodite, rather large, white, in axillary panicles. Calyx 4-5-lobed, deciduous. Petals 4-5, imbricate. Stamens numerous, inserted round the disk. Ovary 8-20-celled, the cells peripheral round a thick axis; style short; stigma deciduous; ovules numerous, 2-seriate in each cell. Fruit a large 8-15-celled berry. Seeds numerous, embedded in aromatic pulp.—Species 3.—Indo-Malayan.

Mucilaginous, aromatic, acid pulp much used in diarrhœa, dysentery and cholera.

A. marmelos Correa is used medicinally in Indo China and East Africa, *A. decandra* F. Villar. in Indo China and philippine Islands.

OFFICIAL:—The fruit of *Crataeva Marmelos* Linn.=*Aegle Marmelos* Correa da Serra (Portugal).

1. **Aegle marmelos** Corr. in Trans. Linn. Soc. V (1800) 223; Roxb. Corom. Pl. t. 143; Wight Ic. t. 16; Bedd. Fl. Sylv. t. 161.—PLATE 201.

A small or medium sized deciduous tree armed with straight sharp axillary thorns, 2.5 cm. long. Leaves alternate, 3-foliate, rarely 5-foliate; petiole 2.5-6.3 cm. long, terete. Leaflets 5-10 by 2.5-6.3 cm., ovate or ovate-lanceolate, crenate, acuminate, membranous, pellucid-punctate, the lateral opposite, subsessile, the terminal long-petioluled. Flowers greenish white, sweet-scented, about 2.5 cm. across, 2-sexual, in short axillary panicles. Calyx flat, pubescent, 4-lobed; lobes rounded, sometimes obscure. Petals 4, spreading, oblong, thick, gland-dotted, much exceeding the sepals, imbricate. Stamens numerous; anthers elongate, apiculate; filaments free or fascicled, inserted round an inconspicuous disk. Ovary ovoid, cells 10-20; style terminal, short, deciduous; stigma capitate; ovules numerous, 2-seriate. Fruit 5-18 cm. diam., globose, grey or yellowish, rind woody. Seeds numerous, oblong, compressed, with a wooly mucous testa, embedded in orange-coloured sweet pulp.

Distribution: Wild in the sub-Himalayan tract, Central and S. India, and Burma. Often planted all over India and Burma.

The root is sweet; cures fevers due to " tridosha ", pain in the abdomen, palpitations of the heart, urinary troubles, hypochondriasis, melancholia; removes " vata ", " pitta ", and " kapha ". The leaves are astringent, digestive; laxative and febrifuge when fresh; remove " vata " and " kapha "; useful in ophthalmia, deafness, and inflammations.—The flowers allay thirst and vomiting; useful in dysentery. —The unripe fruit is oily, bitter, acrid, sour; tasty, but difficult to digest; appetiser, binding; cures dysentery; removes pain.—The oil is hot and cures " vata ".—The ripe fruit is acrid, bitter, sweet; appetiser, binding, tonic, febrifuge; causes biliousness and "tridosha"; removes " vata " and " kapha "; good for the heart (Ayurveda).

The ripe fruit is hot and dry; tonic, restorative, astringent, laxative; good for the heart and the brain; bad for the liver and the chest (Yunani).

The unripe fruit is cut up and sun-dried, and in this form is sold in the bazaars in dried whole or broken slices. It is regarded as astringent, digestive and stomachic, and is prescribed in diarrhœa and dysentery, often proving effectual in chronic cases, after all other medicines have failed. It seems especially useful in chronic diarrhœa; a simple change of the hours of meals and an alteration in the ordinary diet, combined with bael fruit, will almost universally succeed.

In the Konkan the small unripe fruit is given with fennel seeds and ginger, in decoction, for piles.

The ripe fruit is sweet, aromatic and cooling; and, made into a morning sherbet, cooled with ice, is pleasantly laxative and a good simple cure for dyspepsia. The dried ripe pulp is astringent and used in dysentery.

The root bark is sometimes made into a decoction and used in the cure of intermittent fever. It constitutes an ingredient in the *dasamul* or ten roots. " Used on the Malabar Coast in hypochondriasis, melancholia, and palpitation of the heart."

The leaves are made into poultice, used in the treatment of ophthalmia, and the fresh juice diluted is praised in catarrhs and feverishness.

The fresh juice of the leaves is given, with the addition of black

pepper, in anasarca, with costiveness and jaundice. In external inflammations, the juice of the leaves is given internally to remove the supposed derangement of humours.

The expressed juice of the leaves is used in ophthalmia and other eye affections. In Malabar a decoction of the leaves is valued in asthmatic complaints. A hot poultice to the head is used in delirium of fevers.

A water, distilled from the flowers, is said to be aledipharmic.

A decoction of the root of *Aegle Marmelos* is given with sugar and fried rice for checking diarrhœa and gastric irritability in infants.

The root, leaves, and bark are prescribed as an antidote to snake venom (Sushruta, Vagbhata, Brihannighantaratnakara, Nighantaratnakara, Bapat, Vrindamadhava, Yogaratnakara, Sharangdharasamhita).

In Cambodia the fruit is prescribed in tuberculosis and hepatitis.

A liquid extract of the fruit was tried in several cases of dysentery and diarrhœa and found to be generally useful. A syrup of the pulp of this fruit was adminstered to a few cases of chronic enteritis; the patients derived benefit after long continued use (Koman).

No part of the plant is an antidote to snake venom (Mhaskar and Caius).

Dikshit and Dutt have carried out a preliminary chemical examination of the root, bark, leaf, fruit, and seed (*Journ. Ind. Chem. Soc.*, 1930).

Arabic: Safarjalehindi, Shul—; *Assam:* Bel—; *Bengal:* Bel, Bela, Vilva—; *Bombay:* Bela, Bila—; *Burma:* Okshit, Opeshit, Ushitben—; *Canarese:* Bilva, Bilvapatre, Kumbala, Malura—; *English:* Bael Fruit Tree, Bengal Quince, Golden Apple, Holy Fruit, Indian Quince, Stone Apple—; *Gond:* Mahaka, Maika—; *Gujarat:* Bil, Billy—; *Hindi:* Bel, Bili, Sirphal, Siriphal—; *Indo China:* Bau nau, Mak toum—; *Khond:* Belando—; *Kolami:* Lohagasi—; *Konkani:* Bel, Bello—; *Kumaon:* Bel—; *Kurku:* Bela, Corvalum—; *Lambadi:* Billadu—; *Magahi:* Auretpang—; *Malayalam:* Kuvalam, Mavilavu, Vilvam—; *Marathi:* Bel—; *Nasirabad:* Babbarto, Bel—; *Persian:* Safarjalehindi, Shul—; *Portuguese:* Bilva, Mabua, Marmeleira da India, Marmelo da India, Marmelos de Bengala, Sirifoles—; *Sanskrit:* Adhararuha, Asholam, Atimanga-

liya, Bilva, Duraruha, Gandhapatra, Goharitaki, Hridyagandha, Kantakadhya, Kapitana, Karkatavha, Lakshmiphala, Mahakapitthakhya, Mahaphala, Malura, Mangalya, Nilamallika, Patrashreshtha, Pitaphala, Putivata, Sadaphala, Samirasara, Sangrahi, Satyadharma, Satyaphala, Shailapatra, Shailusha, Shalatu, Shalya, Shandilya, Shivadruma, Shiveshtha, Shriphala, Sitanuna, Somaharitaki, Sunitika, Tripatra, Trishakhapatra, Trishikha—; *Sind:* Bila, Katori—; *Sinhalese:* Belli—; *Tamil:* Aluvigam, Iyalbudi, Kuvilam, Mavilangai, Vilvam, Villuvam—; *Telugu:* Bilvamu, Maluramu, Maredu, Sailushamu, Sandiliyamu, Sriphalamu—; *Tulu:* Bellapatre—; *Urdu:* Bel—; *Uriya:* Belo, Bilwa, Sripholo—.

SIMAROUBACEAE.

Trees or shrubs, usually with bitter bark. Leaves alternate, pinnate or rarely simple; stipules 0 or deciduous. Flowers regular, small, 1-sexual or polygamous rarely hermaphrodite. Calyx 3-5-lobed. Petals 3-5, rarely 0, valvate or imbricate. Disk usually present. Stamens as many as or twice as many as the petals, rarely indefinite, inserted at the base of the disk; filaments free; anthers usually introrse, dehiscing longitudinally. Ovary free, 1-6-celled; styles 2-5, free or united; ovules usually 1 in each cell. Fruit usually of 2-6 distinct carpels, sometimes samaroid or baccate. Seeds usually solitary.—Genera 28. Species 125.—Tropical and subtropical.

A. Ovary deeply divided
  Ovule solitary in each cell
  a. Stamens twice as many as petals
    1. Leaves pinnate. Fruit samaroid .... AILANTHUS.
    2. Leaves simple. Fruit drupaceous, variously winged .... SAMADERA.
  b. Stamens as many as petals
    1. Disk thick, entire. Flowers panicled. Styles connate ... PICRASMA.
    2. Disk 4-lobed. Flowers compoundly cymose. Styles nearly free .... BRUCEA.
    3. Disk absent. Flowers panicled. Styles connate .... EURYCOMA.
B. Ovary entire, 5-celled
  Stem spiny. Leaves 2-foliolate .... BALANITES.

Non-astringent bitter tonics.

They contain bitter substances— α-picrasmin, β-picrasmin quassin, samaderin—and glucosides—cedrin—.

OFFICIAL:—Quassin (France, Spain).

Brucea sumatrana Roxb. (Holland).

Picraena excelsa Lindl. (Belgium, France, Holland, Italy, Spain)=*Quassia excelsa* Swartz (Portugal),—(Sw.) Lindl. (Great Britain).

Picrasma excelsa Planchon (Austria, Norway); *P. excelsa* (Swartz) Planchon (Germany, Russia, Turkey, United States); *P. quassioides* Benn. (Japan).

Quassia amara Linn. (Austria, Belgium, France, Germany, Holland, Italy, Norway, Portugal, Russia, Spain, Sweden, Turkey, United States); *Q. amara* Linn. fil. (Switzerland); *Q. simaruba* Linn. =*Simaruba officinalis* De Cand. (Portugal).

Simaruba amara Aubl. (Holland); *S. officinalis* DC. (Switzerland).

AILANTHUS Desf.

Lofty trees. Leaves alternate, pinnate; leaflets alternate or subopposite. Flowers in terminal or axillary branched panicles, small; pedicels bracteate. Calyx short, 5-fid; lobes equal imbricate. Petals 5, spreading, induplicato-valvate. Disk 10-lobed. Stamens 10 in the male, 2-3 in the hermaphrodite and 0 in the female flowers, inserted at the base of the disk; filaments very short or filiform, without scales. Ovary 2-5-partite (rudimentary in the male flowers); ovule 1 in each cell, semianatropous; styles connate. Samaras 1-5, large, membranous, linear-oblong, veined, 1-seeded in the middle. Seed compressed; testa membranous; albumen scanty, adhering to the testa; cotyledons flat, foliaceous, suborbicular.—Species 8.—Indo-Malaya, China, Japan, Australia.

1. Leaflets very coarsely toothed at the base. Filaments several times exceeding the anther .... 1. *A. glandulosa.*
2. Leaflets coarsely toothed. Filaments shorter than the anthers .... 2. *A. excelsa.*
3. Leaflets entire. Filaments longer than the anthers .... 3. *A. malabarica.*

The bark is tonic and febrifuge. The genus is noted for anti-diarrhœal and antidysenteric properties.

The following are used medicinally in the Malay Peninsula—*A. glandulosa* Desf.—; in Indo China—*A. fauveliana* Pierre, *A. glandulosa* Desf., *A. malabarica* DC.—; in China—*A. glandulosa* Desf.—; in the Philippine Islands—*A. moluccana* DC.—.

1. **Ailanthus glandulosa** Desf. in Mém. Acad. Sc. Par. 1786 (1789) 265, t. 8.

A lofty deciduous tree producing abundant rootsuckers. Leaves up to 0.9 m. long, pubescent or nearly glabrous; leaflets very numerous, divided very unequally by the midrib, paler beneath, very coarsely toothed at the base, usually with 1-3 pairs of glandular teeth near the base. Flowers small, in much-branched panicles. Petals wooly-tomentose inside. Filaments filiform, exserted, several times exceeding the anther, hispid at base. Samara twisted at the top, 2.5-5 cm. diam.; seed near the centre of the samara, about 6 by 2.5 mm.

Distribution: Cultivated in the hills of the Punjab.—A native of China.

The bark is an active vermifuge; in powder it has a strong, narcotic, nauseating odour. It exerts a powerful, depressing influence over the nervous system similar to that of tobacco. It has been found useful in dysentery.

In China and Malaya the fruits are used for ophthalmic diseases. The leaves are considered astringent.

In Indo China a decoction of the bark is given in the dysentery of infants and in hæmorrhage. The leaves are used in the preparation of a lotion to be prescribed in seborrhea of the scalp and in scabies. Both the bark and the leaves are considered toxic.

The leaves contain an anthoxanthin, quercetin.

Canton: Fung Ngaan Tso—; *Chinese:* Ch'ou Ch'un, Ch'un Shu, Fen Yen Tsao, Tch'eou Tch'ouen—; *English:* Ailanto, Chinese Sumach, Japan Varnish Tree, Stinking Cedar, Tree of the gods, Tree of heaven—; *French:* Ailanthe, Ailanto, Langit, Vernis du Japon—; *German:* Goetterbaum—; *Indo China:* Bach bi, Hu bach bi, Vu bach

bi—; *Italian:* Ailanto—; *Malaya:* Foong ngan chow—; *Malta:* Japanese Varnish Tree, False Shumack, Ailanto, Xumach—.

2. **Ailanthus excelsa** Roxb. Corom. Pl. t. 23; Wight Ill. t. 67.—PLATE 202.

A tree 18-24 m. high. Leaves unequally or equally pinnate, usually 20-30 cm. but sometimes reaching 60-90 cm. long, the younger tomentose, the older more or less so or glabrous; leaflets 8-14 pairs, alternate or subopposite, very variable in shape, 10-15 cm. long, coarsely and irregularly toothed or sublobate, very unequal at the base; petiolules 2-5 cm. long. Flowers in large lax often much-branched panicles; pedicels long, slender. Calyx-lobes ovate-triangular. Petals 4 mm. long, ovate-lanceolate, glabrous, reflexed. Filaments glabrous, about half as long as the anthers. Samara 3.8-5.5 cm. long by 1-1.3 cm. broad, lanceolate, acute at both ends, reddish brown, twisted near the base, many-nerved, the nerves reticulate above the seed, otherwise nearly parallel. Seed solitary in the centre of the samara.

Distribution: Indigenous in the Indian Peninsula, and often planted in various parts of India.

The bark is bitter; refrigerant, astringent, appetiser, anthelmintic, febrifuge; good in complaints of children, diarrhœa, dysentery, earache; cures skin diseases, troubles of the rectum, fevers due to "tridosa", allays thirst; removes bad taste in the mouth (Ayurveda).

The bark is aromatic and used for dyspeptic complaints. It is also regarded as a tonic and febrifuge in cases of debility. Expectorant and antispasmodic, given in chronic bronchitis and asthma. Also used as an astringent in diarrhœa and dysentery.

In Bombay the bark and leaves are in great repute as a tonic, especially in debility after child-birth. In the Konkan the juice of the leaves is usually administered in khir, or the juice of the fresh bark is given with cocoanut juice and treacle, or with aromatics and honey; it is said to stop after-pains.

Canarese: Bende, Dodda, Doddabevu, Hebmani, Hem, Hire—; *Ceylon:* Perumaram—; *Deccan:* Maharukh, Varul—;

Gujarat: Mothoaraduso, Motoaduso—; *Hindi:* Limbado, Maharukha—; *Lambadi:* Mateslimbiru—; *Malayalam:* Mattipongilyam, Peru—; *Marathi:* Adulsa, Adusa, Mahanimb, Maharuka—; *Meywar:* Arua—; *North-Western Provinces:* Arua—; *Palamow:* Ghorkaram—; *Porebunder:* Aduso, Araduso, Mhotoaraduso—; *Rajputana:* Arua—; *Sanskrit:* Aralu, Atarusha, Madala, Mahanimba, Maharakha, Pisasha—; *Sinhalese:* Kumbalu—; *Tamil:* Agal, Naru, Peru, Peruppi, Pi—; *Telugu:* Pedda, Peddamandu, Peddamanu, Peyyavepa—; *Uriya:* Gorimakkaba, Mahala, Mahanimbu, Yoli—.

3. **Ailanthus malabarica** DC. Prodr. II (1825) 89; Wight Ic. t. 1604; Bedd. Fl. Sylv. t. 122.—PLATE 203.

A large tree. Leaves very large, 45-60 cm. long, crowded, spreading, glabrous; leaflets 8-10 pairs, 7.5-15 by 3-5.5 cm., alternate or subopposite, ovate-oblong or oblong-lanceolate, tapering, acute or acuminate, entire, glabrous, glaucous beneath, unequal-sided at the base, the upper side the larger and rounded, the lower smaller and acute; petiolules 5-20 mm. long. Flowers white (the bisexual rather larger than the male), in lax axillary panicles; pedicels short. Calyx-lobes triangular, acute. Petals about 4 mm. long, oblong-lanceolate, Stamens longer than the petals; filaments filiform, much longer than the anthers. Samara 5-6.3 by 1.5-2 cm., linear-oblong, rounded at both ends, reddish brown, not or very rarely twisted.

Distribution: Konkan, Deccan, W. Ghats from N. Kanara and Mysore to Travancore, up to 3,000 ft., Ceylon, eastern slopes of the Pegu Yoma in Burma, Cochin-China.—Often planted in S. India.

The bark is given in dyspepsia, and is also considered a valuable tonic and febrifuge. It yields a fragrant resin, which, reduced to powder, mixed with milk and strained, is given in small doses in dysentery, and also in bronchitis, and is reputed to be an excellent remedy, chiefly owing to its balsamic properties. It is a terebinthinate-stimulant, its action being chiefly directed to the mucous surface of the genito-urinary organs and of the large and small intestines.

The juice of the fresh bark is said to be a valuable remedy in dysentery.

The fruit, triturated with mango, and mixed with rice, is reckoned useful in cases of ophthalmia.

The root bark coarsely bruised and kept soaking in gingelly oil is given internally as an antidote to cobra bite.

In Indo China the root is considered anti-dysenteric. The bark is used as an antiperiodic. The leaves are recommended in cephalalgia and gastralgia.

This tree is found growing on the west coast and yields a fragrant resin known as mutti-pal (Simaruba) used in the Indian jails as an excellent remedy in dysentery. The juice of the bark administered in curd or milk twice a day is a favourite remedy on the west coast for the cure of diarrhœa and dysentery. Fifteen cases of dysentery among out-patients were treated with the juice of the bark with very satisfactory results. At Cannanore Dr. Thunrmon Singh, medical officer of the central jail there, told me that he found simaruba a very efficacious remedy for dysentery among the jail population. Manson in his "Tropical Diseases" also speaks highly of its efficacy in dysentery (Koman).

The root bark is not an antidote to snake venom (Mhaskar and Caius).

The bark and the leaves are said to contain ailanthic acid.

Anamalais: Mattipal—; *Canarese:* Bagadhupa Baggadadhupa, Devadaru, Dhupa, Gugguldhupa, Gujjaladhupa, Hem, Maddi, Maddidhupa, Mandadhupa, Uguludhupa—; *Hassan:* Mandadhupa—; *Indo China:* La Linh, Lim vang, Suat—; *Kadir:* Mattipalam, Tumam—; *Malayalam:* Mattipalam, Matippomaliyam, Patattavetti, Payan, Peru, Ponnaliyam—; *Marathi:* Guagguladhup, Ud—; *Sanskrit:* Aralu, Atisarahita, Gugguladhupa, Mahanimbu, Pisasha—; *Sinhalese:* Kambalu, Valbiling—; *Tamil:* Mattipalai, Perumaram, Pongiliyam—; *Telugu:* Maddipalu, Peddamanu—.

SAMADERA Gaertn.

Small glabrous trees. Leaves alternate, simple, short-petioled, oblong, coriaceous, shining. Flowers hermaphrodite, few, in axillary and terminal umbels. Calyx small, 3-5-partite, glandular at the base

outside, imbricate. Petals 3-5, coriaceous, much longer than the calyx, imbricate. Disk large. Stamens 6-10, with small basilar scales, included. Carpels 4-5, distinct, free; ovule solitary, pendulous; styles free at the base, more or less united above; stigmas acute. Drupes 1-5, large, dry, compressed, rigid, winged. Seed solitary; testa membranous; cotyledons plano-convex, fleshy; radicle very short. —Species 7. Madagascar, Indo-Malaya.

S. indica Gaertn. is used medicinally in the Philippine Islands, *S. madagascariensis* A. Juss. in Madagascar.

1. **Samadera indica** Gaertn. Fruct. II (1791) 352, t. 156; Wight Ill. t. 68.—PLATE 204.

A small tree 9-10.5 m. high, with stout branches. Leaves large, sometimes reaching 25 by 9 cm., elliptic-oblong, usually shortly acuminate, entire, reticulately veined, glabrous, shining, base rounded rarely subacute; petioles 1.3-2 cm. long, stout. Flowers in few- or many- flowered umbles; peduncles axillary, glabrous, often longer than the leaves; pedicels 1-2 cm. long, glabrous, red. Calyx small, glabrous, persistent; lobes broad, thick, ciliate. Petals 2-2.5 cm. long, oblong, obtuse. Stamens twice as many as the petals and slightly shorter than them; filaments long, with a hairy scale at the base. Ovary shortly stalked, glabrous, usually 4-celled; style glabrous, a little longer than the stamens. Ripe carpels 5-6.3 cm. long, nearly semicircular, much compressed, smooth, reticulate. Seed large.

Distribution: Bombay, Konkan, W. coast of Madras Presidency, in evergreen forests in Malabar and Travancore, Ceylon.

The bark is used as a febrifuge.

An infusion of the wood is taken as a general tonic.

The bruised leaves are externally applied in erysipelas. An infusion is a good insecticide and is said to be particularly destructive to white ants.

An oil extracted from the kernels of the fruit forms a good application in rheumatism.

In the Philippine Islands the wood in the form of either powder or decoction is used as a tonic and is prescribed in fever and dyspepsia.

The plant contains a bitter substance, samaderin.

Bicol: Manungal—; *Burma:* Kathai—; *Malayalam:* Karinnotta, Notta—; *Marathi:* Lokhandi—; *Pampangan:* Manungal—; *Sinhalese:* Samadara—; *Tagalog:* Manungal, Mongal—; *Tamil:* Nibam—; *Visayan:* Daraput, Linatoganac, Lintongamai, Manungal, Mauingdato, Palagarium, Palagium, Ponoan—.

Var. **lucida** Blatter nov. comb.—*Samadera lucida* Wall. Cat. 1062; Pl. As. Rar. II, t. 168.

Leaves paler green. Umbels short-stalked, sometimes almost sessile. Fruit pear-shaped.

Distribution: Tenasserim, perhaps also Andamans.

PICRASMA Bl.

Trees or shrubs. Leaves imparipinnate. Flowers dioecious or polygamous, in axillary panicles. Calyx minute, 4-5-toothed. Petals 4-5, often enlarging after flowering, valvate. Stamens in males as many as the petals, inserted round the thick disk, in females often wanting. Ovary of 3-5 distinct lobes each with a solitary ovule. Fruit of 1-5 fleshy or membranous drupes.—Species 8.—Tropical and subtropical.

1. A scrambling shrub. Leaflets 9-15 .... 1. *P. quassioides.*
2. A moderate-sized tree. Leaflets 3-7 .... 2. *P. javanica.*

The bitter bark is febrifuge.

P. quassioides Benn. is used medicinally in Japan and Indo China, *P. javanica* Bl. in the Philippine Islands.

OFFICIAL:—The wood of *P. excelsa* Planchon (Austria, Norway); *P. excelsa* (Swartz) Planchon (Germany, Russia, Turkey, United States); *P. quassioides* Benn. (Japan).

1. **Picrasma quassioides** Bennett Pl. Jav. Rar. (1838-52) 198.—*Simaba quassioides* D. Don in Prodr. Fl. Nep. (1825) 248.—PLATE 205.

A large deciduous shrub or small tree up to 1.2 m. girth and 12 m. high. Young shoots, petioles and the rhachis of young leaves rather densely clothed with rusty pubescence. Twigs and branches smooth, grey, with numerous small circular lenticels. Bark dark

brown, roughish. Blaze 6-12 mm., white or yellowish. Leaves and bark bitter. Leaves 23-45 cm. long, pubescent. Leaflets 7-15, increasing in size from the base, the lateral opposite, the terminal 9-18 by 3-6.3 cm.; all ovate to lanceolate, long-acuminate, serrate, membranous, nearly glabrous when mature. Petiolules of the lateral leaflets 0-2.5 mm. long, of the terminal leaflet 1.2-3 cm. long. Flowers 6-7.5 mm. diam., green, in axillary corymbose pubescent panicles 7.5-15 cm. long. Fruit of 3-5 rather membranous drupes 5-7.5 mm. diam., black when ripe, each containing one seed.

Distribution: Himalaya from the Chenab eastwards, 4,800 ft., Chamba, Kulu, Bashahr, N. Garhwal between 6,000 and 8,000 ft., Nepal, Bhutan.

The bark, wood and root are used as a febrifuge.

The leaves are applied to itch.

Bengal: Bhurungi—; *Burma:* Thityuben—; *Garhwal:* Karwi—; *Hindi:* Baringi, Bharangi, Charangi, Kashshing—; *Indo China:* Hoang luyen thu—; *Japan:* Kuboku—; *Jaunsar:* Karui, Tithai—; *Nepal:* Shamabaringi—; *North-Western Provinces:* Tithar, Trita, Tutai—; *Punjab:* Bera, Bering, Birgo, Hala, Kashbar, Mathu, Mont, Pesho, Puthorin, Tithai, Tithu, Trita, Tuthai—.

2. **Picrasma javanica** Bl. Bijdr. 248; Bennett Pl. Jav. Rar. 197, t. 41.

An evergreen tree, all parts glabrous. Leaves unpaired-pinnate, 20-23 cm. long, the rhachis furnished at base with small rotundate stipules; leaflets in 3 pairs with an odd one, oblong or elliptic-oblong, on a 4-6.3 mm. long petiolule, rounded at base, bluntish apiculate, 10-12.5 cm. long, entire, membranous, beneath silky-shining, laxly net-veined. Flowers small, greenish white, in almost trichotomous cyme-like glabrous axillary panicles shorter than the leaves. Calyx 4-cleft, the lobes rotundate, almost acute. Petals 4, oblong, rather acute, glabrous. Drupes usually by 4 or fewer, globular, raised on the flat and thick torus, white, smooth.

Distribution: From Martaban to Tenasserim, Malay Peninsula, Andamans.—Java.

The Karens use the bark as a febrifuge.

Karen: Napawou—; *Philippines:* Nalis—; *Visayan:* lanete.

Brucea J. S. Mill.

Bitter trees or shrubs. Leaves very large, unequally pinnate. Flowers very small, in very numerous very small cymes collected into axillary panicles. Calyx minute, 4-partite, imbricate. Petals 4, minute, linear, imbricate. Disk 4-lobed. Stamens 4, inserted beneath the disk; filaments naked. Ovary deeply 4-lobed, or consisting of 4 entirely free carpels. Drupes 4, entirely free, ovoid, somewhat fleshy. Seed solitary, exalbuminous.—Species 6.—Paleotropics.

The genus is bitter and is credited with antiperiodic, and antidysenteric properties.

The following species are used medicinally in Indo China—*B. mollis* Wall., *B. sumatrana* Roxb.—; in the Philippine Islands—*B. sumatrana* Roxb.—; in Abyssinia—*B. ferruginea* L'Hérit.

Official:—The fruit of *B. sumatrana* Roxb. (Holland).

1. **Brucea sumatrana** Roxb. Hort. Beng. (1814) 12; Fl. Ind. I (1832) 449.—Plate 206.

A large evergreen shrub, all younger parts softly pubescent; leaves 30-45 cm. long or longer, unpaired-pinnate; leaflets in 2-3 pairs with an odd one, obtuse and often somewhat oblique at base, ovate-lanceolate, on a short but slender petiolule, 5-6.3 cm. long, acuminate, coarsely crenate-toothed, densely pubescent or villous, especially beneath; flowers minute, purple, in little cymes or clusters and forming an interrupted tomentose racemes in the axils of the leaves as long or shorter than them; drupes the size of a small pea, glabrous.

Distribution: Assam, Tenasserim, Andamans, Malay Peninsula.—Malaya to the Philippines, S. China, Australia.

In Indo China the seeds are well known for their anthelmintic and antidysenteric properties, and they are believed to have also some antipyretic value. They are toxic.

" Macassar Kernels " are much used in Java as a cure for dysentery.

Annam: Cay sau dau rung—; *Indo China:* Damli thuang, Kho sam, Sau dau rung, Nam kho luyen—; *Malay:* Ampadubarrowing, cherek jantan, Embalau, Embalau betina, Embalau padang, Hampedu

bruang, Lada pahit—; *Philippines:* Bogobogo—; *Quang-binh:* Bo net—; *Quang-tri:* Cay sau dau cut chuot—; *Sinhalese:* Kaputugedi—.

EURYCOMA Jack.

Small trees, with bitter bark. Leaves very large, unequally pinnate, with entire leaflets. Flowers polygamous, in much-branched subterminal hairy panicles. Calyx minute, 5-toothed, valvate. Petals 5, induplicate-valvate. Disk 0. Stamens in male and hermaphrodite flowers 5, smaller in the latter; filaments attached to the base of the petals. Ovary 5-partite, free; styles 5, connate, stigmas distinct. Drupes 3-5, stipitate. Seed solitary, pendulous, exalbuminous.—Species 3.—Indo-Malaya.

E. longifolia Jack. is used medicinally in Indo China.

1. **Eurycoma longifolia** Jack., Roxb. Fl. Ind. ed. Carey II, 307.

A slender red-stemmed shrub or treelet about 4.5 m. tall often unbranched. Leaves terminal, 45-60 cm. long; leaflets softly coriaceous, oblong-lanceolate acute, base oblique cuneate, dark green glabrous 7.5-10 cm. long, 2-2.5 cm. wide. Panicles over 60 cm. long, glandular hairy. Sepals ovate green. Petals ovate-lanceolate, redish pubescent, 6 mm. long. Stamens longer than calyx. Disk-glands bilobed ciliate. Drupes 1-5, stipitate ovoid, 13 mm. long, 6 mm. through, yellowish brown.

Distribution: Malay Peninsula.—Tavoy, Cambodia, Sumatra, Borneo.

The bark and root are bitter. A decoction of the root is a remedy in intermittent fevers.

In Indo China the bark is given in indigestion; the fruits are prescribed in dysentery.

Indo China: Ba binh, Bach Binh, Hau phat—; *Malay:* Bidara pahit, Duak, Juak, Lempedu pahit, Penvarpet, Tongkat baginda—.

BALANITES Del.

Spiny shrubs or trees. Leaves alternate, 2-foliolate; leaflets coriaceous, entire. Flowers greenish, in axillary cymes, fragrant.

Sepals 5, concave, imbricate. Petals 5, oblong, spreading, glabrous or villous, imbricate. Stamens 10, inserted in the furrows at the base of the disk; filaments naked, filiform, subulate; anthers inserted at the back. Disk thick, depressed-conic or pulvinate, 10-grooved, hollowed at the apex. Ovary globose, half-immersed in the disk, villous, 5-celled; ovule solitary in each cell, linear, pendulous below the apex of the cell; style short, subulate, terete or 5-furrowed; stigmas 1 or 5, simple, minute. Drupe fleshy, oily; putamen bony, 5-angled, 1-celled, 1-seeded. Seed pendulous, ovoid; testa subfibrous; albumen 0, embryo green, ovoid; cotyledons thick, oblong, plano-convex, sometimes corrugated or 2-lobed; radicle superior.—Species 3.—Egypt, tropical Africa and India.

Therapeutically the genus has little importance.

B. aegyptiaca Del. is used medicinally in various parts of Africa.

1. **Balanites aegyptiaca** Del. Ill. Fl. d'Eg. (1813) 263, t. 28, f.1.—*Ximenia aegyptiaca* Linn. Sp. Pl. (1753) 1194.—*X. aegyptiaca* Juss. Gen. 260.—*X. Agihalid* Mill. Gard. Dict. ed. VIII, n. 2.—*X. ferox* Poir. Encycl. VIII, 805.—*Balanites Roxburghii* Planch. in Ann. Sc. Nat. ser. 4, II (1854) 258.—*B. aegyptica* Wall. Cat. n. 6855; Wight Ic. t. 274.—*B. ferox* G. Don Gen. Syst. I, 774.—*Agialida Roxburghii* O. Ktze. l.c.—PLATE 207 (under *Balanites Roxburghii* Planch.).

A shrub or small evergreen tree, rarely reaching 9 m. Young parts pubescent or tomentose or glabrescent. Twigs armed with stout axillary or supraaxillary spines, 1-6 cm. long, which often bear leaves or flowers. Leaves alternate, 2-foliolate; petioles 3-6 mm. long; leaflets elliptic or varying from ovate- or obovate- elliptic or rotundate, obtuse or subacute or broadly pointed, 1-5 cm. long; petiolules up to 5 mm. long. Flowers small, greenish white, fragrant, in axillary few- or many- flowered short-peduncled cymes or fascicles. Sepals 5, ovate, 3 mm. long, pubescent outside, silky within. Petals 5, oblong-obovate, glabrous outside, silky-villous or glabrous inside, very little longer than the sepals. Stamens 10; filaments subulate, glabrous; anthers dorsifixed. Disk cupular, with a 10-lobed glandular margin. Ovary ovoid, silky, 5-celled; ovules solitary in each cell;

style short, conical. Fruit an ovoid drupe, 2.5-6 cm. long, on a short thick stalk, faintly 5-grooved, pale yellow when ripe; pulp 5 mm. thick, with an offensive greasy smell; stone hard, fibrous. Seed exalbuminous; embryo with thick plano-convex, corrugated or 2-lobed cotyledons and a superior radicle.

Distribution: Drier parts of India, Arabia, Egypt, Eritrea, tropical Africa.

The flowers are sweet smelling, bitter, heating; cure "vata" and "kapha".—The fruit has a bitter sharp taste; digestible, alterative, anthelmintic, alexipharmic, analgesic, antidysenteric; removes "vata"; cures ulcers, skin diseases, rat bites.—The oil from the fruit cures ulcers (Ayurveda).

The fruit is used for boils, leucoderma, and skin diseases (Yunani).

The bark, unripe fruit, and leaves are pungent, bitter and purgative, and are considered to have anthelmintic properties.

The seeds are given in coughs. They have been found useful in colic.

The plant is prescribed in the treatment of snake-bite (Sushruta).

The African Arabs use the pulp of the fruit as a detergent, and the bark to poison fish.

A decoction of the root is a Tonga emetic.

The oil is used as a remedy for sleeping sickness in Uganda and as a purgative in the Sudan.

All parts of the plant are equally useless in the symptomatic treatment of snake-bite (Mhaskar and Caius).

Cushny (*Bull. Imp. Inst.*, 1908) has proved that the oil produces no benefit in sleeping sickness, and is only slightly aperient.

Arabic: Elheglyg, Heghelig—; *Bengal:* Hingon—; *Bogos:* Selibatico—; *Bombay:* Hinganbet—; *Canarese:* Ingalarade, Ingalare, Ingalukke—; *Cutch:* Hinganbet—; *Deccan:* Hingan, Hinganbet—; *French:* Dattier du désert—; *Gond:* Garrah—; *Gujarat:* Egorea, Hinger, Hingoriyun, Igorea, Ingoriyo—; *Hausa:* Aduwa—; *Hindi:* Hingan, Hingen, Hingol, Hingot, Hingota, Hingu, Ingua—; *Malayalam:* Nanjunta—; *Marathi:* Hingan, Hingane—; *Masai:* Ol ngoswa—; *Porebunder:* Hingoriyun, Ingoriyan, Ingoriyun—;

Sanskrit: Angarvriksha, Angulidala, Anilantaka, Bhallakivriksha, Daruparnaphala, Gaurtvaka, Hinguputra, Inguda, Ingul, Inguni, Jalajantu, Kantaka, Krisharaka, Kroshtuphala, Munipadapa, Putigandha, Putripatra, Shulari, Tailabija, Tanupatra, Tapasamudrama, Tapasataru, Tiktaka, Tiktarnajja, Vinashaka, Vishakantaka—; *Sudanese:* Heglik—; *Swahili:* Mjunju—; *Tamil:* Nanjundan, Toruvattu—; *Telugu:* Gara, Ingudi, Ringri—; *Tigrinia:* Ciaat, Gouasa, Kuosa, Maghe, Mogah, Gak, Guasa—; *Tonga:* umNulu—; *Ulwar:* Hingar—; *Urdu:* Hingot—; *Uriya:* Ingudihala—; *Wolof:* Soump—.

OCHNACEAE.

Trees or shrubs. Leaves alternate, glabrous, simple or rarely pinnate, stipulate. Flowers regular, hermaphrodite, conspicuous, in racemes panicles or umbels rarely solitary. Sepals 4-5, free, imbricate, persistent. Petals 5, rarely 4-10, free, imbricate. Disk usually thick and enlarged in fruit. Stamens definite or indefinite, inserted at the base of the disk. Ovary 1-10-celled; styles simple; ovules 1-2 in each cell or indefinite. Fruit indehiscent, of several 1-4-seeded drupes or pyrenes, or capsular.—Genera 17. Species 210.—Tropics.

1. Stamens 10. Flowers paniculate or umbellate .... OURATEA.
2. Stamen ∞. Flowers paniculate .... OCHNA.

The barks of some of the members are recommended for the treatment of wounds; they are also considered tonic and ascaricidal.

OURATEA Aubl.
(GOMPHIA Schreb.)

Small trees, glabrous. Leaves alternate, simple, coriaceous, shining, many-nerved, finely serrate; stipules 2. Flowers yellow, in axillary or terminal racemes or umbels. Sepals 5, usually coloured,

persistent. Petals 5, imbricate. Disk thick, lobed. Stamens 10, inserted at the base of the disk; filaments very short; anthers linear, dehiscing by terminal extrorse pores. Ovary deeply 5-6-lobed, lobes 1-celled; styles basal, connate; stigmas simple; ovule 1 in each cell, erect. Fruit of 5 or fewer distinct drupes seated on the enlarged disk. Seed erect; testa membranous; albumen 0; cotyledons fleshy, plano-convex; radicle very short.—Species 150.—Tropics.

Bitter tonics with anthelmintic, vulnerary, and mildly laxative properties.

The following species are used medicinally in the Gold Coast—*O. flava* Hutch. & J. M. Dalz.—; in the West Indies—*O. ilicifolia* Baill., *O. jabotapita* Engler—; in Brazil—*O. hexasperma* Baill., *O. jabotapita* Engler, *O. parviflora* Baill.—; in French Guiana—*O. guianensis* Aubl.—.

1. **Ouratea angustifolia** Baill. ex Laness. Pl. util. Colon. Franc. (1886) 667.—*Gomphia angustifolia* Vahl Symb. II (1791) 49.—Plate 208 (under *Gomphia angustifolia* Vahl).

A small much-branched tree; young parts glabrous. Leaves 7.5-15 by 2.5-5 cm., distichous, oblong-lanceolate, acute, finely serrate, glabrous, closely reticulately veined, base acute; petioles very short; stipules deciduous. Flowers in pyramidal terminal and axillary panicles; buds globose; pedicels slender, jointed near the base. Sepals 4 mm. long, elliptic. Petals 6 mm. long, obovate, shortly clawed. Stamens 10; filaments short; anthers rugose. Ovary glabrous, 4-5-lobed; lobes obovoid; style much exceeding the stamens. Drupes 5 or fewer, 6-10 mm. diam., usually obovoid, smooth, reticulately veined, surrounded by the persistent sepals.

Distribution: Bombay Konkan, W. coast and lower slopes of W. Ghats from S. Kanara to Tinnevelly up to 3,000 ft. in evergreen forests, Ceylon.

The root and leaves are bitter, and are employed in the form of a decoction in Malabar, as a tonic, stomachic and anti-emetic.

Canarese: Addane, Kempokallu, Kempukuntala—; *Konkani:* Valermani—; *Malayalam:* Valermani—; *Marathi:* Valermani—; *Philippines:* Postalagon—; *Sinhalese:* Bokaara—; *Tamil:* Vellai-chilandi—; *Visayan:* Bulocanan, Caranyan—; *Zambales:* Talocton—.

Ochna Linn.

Glabrous trees or shrubs. Leaves alternate, usually serrate, shining, many-nerved; stipules 2. Flowers yellow, in panicles or umbels, springing from a scaly bud beneath the last year's leaves, bracteate. Sepals 5, imbricate, persistent, coloured. Petals 5-12, deciduous, imbricate. Disk thick, lobed. Stamens indefinite, inserted at the base of the disk, shorter than the petals; anthers dehiscing longitudinally, deciduous. Ovary 1-celled, deeply 3-10-lobed; lobes obtuse; ovule solitary in each cell, axile; styles connate or sometimes free at the apex; stigmas simple or capitate. Drupes 3-10, seated on the enlarged disk. Seed erect, oblong; testa membranous; cotyledons thick, plano-convex; radicle minute.—Species 45.—Tropical Asia, Africa, Cape Colony.

1. Flowers very large and handsome .... 1. *O. pumila.*
2. Flowers 13-20 cm. across .... 2. *O. squarrosa.*

The genus has digestive tonic properties.

The following are used medicinally— in the Philippine Islands —*O. squarrosa* Linn.—; in Indo China—*O. harmandii* H. Lec.—; in Guinea—*O. membranacea* Oliver—; in South Africa—*O. atropurpurea* DC.—.

1. **Ochna pumila** Ham. ex D. Don Prodr. Fl. Nep. (1825) 224.

A glabrous undershrub with a woody rootstock sending up annual, erect, scarcely woody shoots 15-45 cm. high. Leaves 7.5-15 by 2.5-6.3 cm., broadly oblanceolate, apex rounded or acute, base gradually narrowed, finely and sharply serrate with apiculate ascending teeth, midrib prominent beneath. Petiole 2.5-5 mm. long. Stipules 7.5-15 mm. long, linear-lanceolate. Flowers 3.8-5 cm. diam., in pedunculate few-flowered axillary umbels 3.8-11.3 cm. long. Peduncle 2.5-7.5 cm. long. Pedicles 1.2-3.8 cm. long. Drupes usually 4-6, 7.5-10 mm. long, oblong, greenish.

Distribution: Foot of Himalaya from Kumaon to Sikkim, Pegu, Bihar, Chota Nagpur (very likely not in Bombay and Madras Presidencies).

The root is used by the Santals as an antidote to snake-bite. A decoction of it is given in certain menstrual complaints, also for consumption and asthma (Campbell).

Santali: Champabaha—.

2. **Ochna squarrosa** Linn. Sp. Pl. ed. 2 (1762) 731; Roxb. Corom. Pl. I, t. 89; Wight Ill. I, t. 69.

A shrub or small tree. Leaves 5-12.5 cm. long, oblong-lanceolate, elliptic or obovate, usually acute, finely serrulate, quite glabrous, base narrowed into a short petiole; stipules lanceolate, 4-6 mm. long. Flowers fragrant, in umbellate panicles on the old wood, or sometimes on short leafless branchlets; pedicels jointed. Sepals coriaceous, 1.3-2 cm. long, elliptic-oblong, with close parallel veins. Petals 5-12, a little longer than the sepals. Stamens indefinite, deciduous; filaments very short; anthers long, linear. Styles completely combined, longer than the stamens. Fruit of 3-6 drupes, 6 mm. long, oblong-ovoid, sessile, black, surrounded by the persistent calyx.

Distribution: Assam, Burma, W. Peninsula, Ceylon.

The bark is a digestive tonic.

The boiled leaves are used as an emollient cataplasm.

The Santals use the root in the same way and for the same purposes as that of *O. pumila.*

Bombay: Kanakchampa—; *Burma:* Hsenway—; *Canarese:* Muda, Mudali, Narole, Ramatanachampaka—; *English:* Golden Champak—; *Konkani:* Kannkchampo—; *Philippines:* Basilay—; *Sanskrit:* Kanakachampa—; *Santal:* Champabaha—; *Saora:* Ondoyimali—; *Tamil:* Panjaram, Shengodu, Sherundi, Shilandi—; *Telugu:* Jammi, Sunari, Sunaru, Tammichetta, Yerrajammi, Yerrajuvi—; *Uriya:* Bonokonyari, Konyari, Nobinisworo—; *Visayan:* Bansilay—.

BURSERACEAE.

Balsamiferous trees or shrubs. Leaves alternate (very rarely opposite), 3- (rarely 1-) foliolate or imparipinnate, without or rarely with stipules. Flowers hermaphrodite or polygamous, usually small, racemose or panicled. Calyx 3-5- fid or -partite, imbricate or valvate. Petals 3-5, free or rarely connate, deciduous, imbricate or valvate. Disk annular or cupular, rarely inconspicuous, free or adnate to the calyx-tube. Stamens as many or twice as many as the petals, inserted at the base or margin of the disk, equal or unequal; filaments free, rarely connate at the base; staminodes 0; anthers usually versatile, 2-celled. Ovary free, 2-5- (rarely 1-) celled, usually attenuated into a short style; ovules 2 (very rarely 1) in each cell, axile, usually pendulous, rarely ascending; micropyle superior; raphe ventral; stigma undivided or 2-5-lobed. Fruit drupaceous, usually indehiscent, containing 2-5 pyrenes, or rarely pseudo-capsular and dehiscent. Seeds pendulous; testa membranous; albumen 0.—Genera 13. Species 350.—Tropics.

A. Drupe dehiscent. Pyrenes separating .... BOSWELLIA.
B. Drupe indehiscent. Pyrenes not separating
   1. Calyx 5-fid. Disk lining the calyx-tube .... GARUGA.
   2. Calyx 4-toothed. Disk cupular .... COMMIPHORA.
   3. Calyx usually 3-fid. Disk annular .... CANARIUM.

Balsamiferous trees or shrubs. The gum-resins are used medicinally as stimulants; they are also employed for fumigation and in plasters.

OFFICIAL:—*Amyris Opobalsamum* Linn.=*Balsamodendron Opobalsamum* Kunth, *A. gileadensis* Linn.=*B. gileadense* Kunth (Portugal).

Balsamodendron africanum Arnott=*Heudelotia africana* A. Rich. (French, Portugal); *B. Ehrenbergianum* O. Berg. (Portugal).

Boswellia spp. (Austria, Denmark, France, Norway, Portugal, Spain); *B. Bhau-Dajiana* Birdwood (Austria, Portugal, Spain); *B. Carterii* Birdw. (Austria, Denmark, France, Norway, Portugal, Spain).

Canarium spp. (Holland, Spain); *C. commune* Linn. (Austria, Spain); *C. luzonicum* Grey (Belgium).

Commiphora sp. (Switzerland); *Commiphora spp.* (Belgium, Denmark, Germany, Great Britain, Holland, Japan, Spain, Sweden, Turkey, United States); *C. abyssinica* Engl. (Austria, France, Italy, Norway),—(Berg.) Engler (Russia); *C. molmol* Engler (Germany, Great Britain, Norway, Turkey); *C. Myrrha* Engl. (Spain); *C. Myrrha* Holm. (Belgium); *C. Myrrha* (Nees) Baillon (United States); *C. opobalsamum* Engler (Italy); *C. Schimperi* Engl. (France, Italy, Norway).

Icica icicariba De Cand. (Portugal).

Boswellia Roxb.

Trees usually with papery bark. Leaves alternate, crowded at the ends of the branches, deciduous, imparipinnate; leaflets opposite, usually serrate. Flowers hermaphrodite, small, white, in axillary racemes or panicles. Calyx small, 5-toothed, persistent. Petals 5, narrowed at the base, imbricate. Disk annular, crenate. Stamens 10, alternately long and short, inserted at the base of the disk. Ovary sessile, 3-celled; ovules 2 in each cell, pendulous; style short; stigma 3-lobed. Drupe trigonous, 3-valved, valves separating from the pyrenes; pyrenes bony, 1-seeded, finally separating from the trigonous axis. Seeds compressed, pendulous; cotyledons contortuplicate, multifid; radicle superior.—Species 10.—Tropical Asia and Africa.

1. Young shoots and leaves pubescent .... 1. *B. serrata.*
2. Glabrous shoots and leaves pubescent .... 2. *B. glabra.*

Balsamiferous trees which secrete the gum-resin known as olibanum or frank-incense.

The better known are:—in South Arabia—*B. carteri* Birdw.—; in East Africa—*B. bhaw-Dajiana* Birdw., *B. carteri* Birdw., *B. freereana* Birdw.—; in China—*B. serrata* Roxb.—; in Nigeria—*B. dalzielii* Hutch., *B. odorata* Hutch.—.

Official:—The gum resin of *Boswellia spp.* (Austria, Denmark, France, Norway, Portugal, Spain), *B. Bhau-Sajiana* Birdwood

(Austria, Portugal, Spain), *B. Carterii* Birdw. (Austria, Denmark, France, Norway, Portugal, Spain).

1. **Boswellia serrata** Roxb. ex Coleb. As. Res. IX (1807) 379; Colebr. in Trans. Linn. Soc. XV, 263, t. V, f. 1.—PLATE 209.

A deciduous middle-sized tree; bark ash-coloured, peeling off in thin flakes; young shoots and leaves pubescent. Leaves 20-38 cm. long; leaflets opposite, 2.5-6.3 by 1.2-3 cm., sessile, 8-15 pairs and an odd one (the pair at the base of the leaf often much smaller than the others), variable in shape, ovate or ovate-lanceolate, usually inequilateral and obtuse, crenate-serrate, more or less pubescent, base acute, rounded, or somewhat truncate. Flowers in axillary racemes, shorter than the leaves. Calyx pubescent outside; lobes broadly triangular-ovate. Petals 5 mm. long, ovate, pubescent outside, tips inflexed. Stamens inserted at the base of an annular crenate disk; anthers slightly pubescent. Ovary surrounded by the disk; style grooved. Drupe trigonous; pyrenes heart-shaped; cotyledons trifid.

Distribution: Common on dry hills throughout the greater part of India (except Assam and Burma).

The bark is sweet, acrid, cooling; binding, tonic; removes "kapha", biliousness; allays asthma; cures dysentery, skin diseases, ulcers; purifies the blood.—The fruit and the flower remove "kapha", "vata", cure leucoderma, and piles.—The gum is sweet, bitter, hot; antipyretic, antiglycuretic, antidysenteric; useful in skin and blood diseases, fevers, diaphoresis, convulsions, mouth sores, vaginal discharges, "vata", dysentery, diabetes, and diseases of the testis (Ayurveda).

The gum is of five kinds. It is hot, dry, with a good flavour and a bad taste, bitter; astringent to the bowels, expectorant; used for boils, scabies, as a collyrium in ophthalmia; useful in intestinal troubles, bronchitis, asthma, cough, bad throat; heals wounds; strengthens the teeth; invigorating; may cause vomiting. Its distillate in oil is carminative and pectoral (Yunani).

The gum of this tree is used as a diaphoretic and astringent, and in the preparation of an ointment for sores. It is also prescribed with clarified butter in syphilitic diseases; with cocoanut oil for sores;

and as a stimulant in pulmonary diseases. It is given in bronchorrœa and chronic laryngitis, employed both internally and in the form of fumigation.

It is an internal and external stimulant, expectorant, stimulant, diuretic, and stomachic. It is also a slight hepatic stimulant. Useful in jaundice, not depending on mechanical obstruction, and in some slight and chronic cases of diarrhœa, dysentery, dyspepsia, pulmonary affections and hæmorrhoids. In the form of an oily solution, it exercises some good influence over the growth of the hair; and in that of an ointment, it excites a healthy action in some weak and unhealthy kinds of ulceration.

The gum-oleoresin is recommended in combination with other drugs for the treatment of snake-bite (Charaka, Sushruta, Yogaratnakara) and scorpion-sting (Charaka, Sushruta).

The gum resin is not an antidote to either snake venom (Mhaskar and Caius) or scorpion-venom (Caius and Mhaskar).

Pearson and Puran Singh have given very complete information as to the occurrence, mode of collection, chemistry, and technical handling of the gum-oleoresin (Ind. Forest Records, vol. VI, part VI). Fowler and Malandkar have suggested a method of extraction of turpentine, resin, and gum from the gum-oleoresin without the use of solvents (Journ. Ind. Inst. Sc.; IV, 1921).

The gum contains oxidising and diastatic enzymes. The oxidase system consists of a peroxidase, an oxygenase, and a substance giving reactions characteristic of the catechol-grouping (Fowler and Malandkar).

The gum appears to resemble true gums in that it yields sugars like arabinose, xylose, and galactose, on hydrolysis. There is some evidence that acids of diminishing molecular weights can be produced from the original gum-acid by successive gentle hydrolysis (Malandkar).

Arabic: Bastaj, Kundur, Luban—; *Bengal:* Kundur, Luban, Salai—; *Bombay:* Salai, Salaphali, Salayadhup, Salga, Guggula—; *Burma:* Bringiloban, Thabi-ben—; *Canarese:* Dupa, Guggala, Guggaladupa, Kunda, Lobana, Maddi, Sambrani, Site, Situmme, Tadika, Turushka, Viseshadhupa—; *Chinese:* Fan Hun Hsiang—;

Cutch: Saliyaguggul—; *Deccan:* Farangiaud, Kundur—; *Gond:* Borsalei, Ganga, Salla—; *Gujarat:* Dhup, Gugali, Mukulsalai—; *Hindi:* Kundur, Luban, Salai, Salga, Salhe, Sali, Salpe, Selgond—; *Kolami:* Salga—; *Kumaon:* Anduga, Anduku, Dumsal, Guggar—; *Lambadi:* Saliria—; *Lohardugga:* Saleya—; *Malayalam:* Hladini, Kunturukkam, Mukundam, Palankam, Parankisamprani, Stayanti, Vellakkunturukkam—; *Marathi:* Salaphali—; *Nagpur:* Salai, Silai—; *Persian:* Kundur—; *Punjab:* Salhi—; *Sanskrit:* Ashvamutri, Asraphala, Bahusrava, Gajabhaksha, Gajapriya, Gajashana, Gajavallabha, Gandhamula, Gandhavira, Hladini, Hraswada, Jalatiktika, Karaka, Konkanadhupa, Kumbhi, Kundu, Kunduru, Kunduruki, Lhadini, Maherana, Maheruna, Mocha, Nagavadhu, Rasala, Salasi, Sallaki, Shallaki, Silhabhumika, Silhaki, Sugandha, Sukhamoda, Surabhi, Surabhisillaki, Surabhisrava, Sushrika, Susrava, Suvaha, Vanakarnika, Vasamaharuba, Viseshadhupa, Yakshadhupa—; *Santal:* Salga—; *Sinhalese:* Kundrikan—; *Spanish:* Arbol del incienzo—; *Tamil:* Attam, Kunduru, Kundurukkan, Kungiliyam, Kungulu, Muraiyidam, Parangichambrani, Sambrani, Valugam, Vellaikkungiliyam—; *Telugu:* Anduga, Dhupamu, Guggilamu, Parangisambrani, Tellaguggilamu—; *Ulwar:* Salar—; *Urdu:* Kundur, Lobana—; *Uriya:* Loban—.

2. **Boswellia glabra** Roxb. Hort. Beng. 90; Corom. Pl. III, t. 207; Bedd. Fl. Sylv. t. 1, 124.—*B. serrata* var. *glabra* Hook. f. in Fl. Brit. Ind. I, 528.

Glabrous. Leaflets entire or nearly so, rounded at the apex.

Distribution: N. W. India, Belgaum Dist., Deccan and Carnatic from the Godavari to Mysore.

The balsam is considered alterative, demulcent, aperient, emmenagogue. It is used in rheumatism and skin diseases.

Bengal: Guggul—; *Hindi:* Gugal—.

Garuga Roxb.

Trees more or less tomentose. Leaves crowded towards the ends of the branches, alternate, imparipinnate; leaflets opposite, subsessile,

serrate. Flowers in dense panicles, polygamous. Calyx campanulate, 5-fid, valvate. Petals 5, inserted on the tube of the calyx, induplicato-valvate. Disk thin with a crenate margin, lining the calyx-tube. Stamens 10, equal, free, inserted in the tube of the calyx at the margin of the disk. Ovary ovoid, sessile, 4-5-celled, attenuated into an erect style; ovules 2 in each cell; stigma capitate, 4-5-lobed. Drupe without valves, globose, fleshy, containing 1-5 bony rugose pyrenes. Seed conform to the cell; testa membranous; cotyledons thin, contortuplicate; radicle short, superior.—Species 7. —Indo-Malayan.

G. floribunda Decne. is used medicinally in the Philippine Islands, *G. pinnata* Roxb. in Indo China and in the Philippine Islands.

1. **Garuga pinnata** Roxb. Hort. Beng. (1814) 33; Corom. Pl. III, 5, t. 208; Wight Ic. tt. 1594, 1595; Bedd. Fl. Sylv. t. 118.—PLATE 210.

A tree sometimes reaching 15 m. in height; bark furrowed, the outer layers peeling off in flakes. Leaves 15-45 cm. long, deciduous in the cold season; leaflets 6-10 pairs and an odd one, opposite or nearly so, subsessile, sometimes 15 cm. long, lanceolate or ovate-lanceolate, usually acuminate, oblique, crenate, pubescent when young, at length glabrous. Flowers yellow, in much-branched axillary tomentose panicles, several together at the ends of the branches; bracts deciduous. Calyx 6 mm. long, campanulate, cleft a little less than half way down, densely tomentose outside; lobes ovate-oblong, subobtuse. Petals 5 mm. long, linear-oblong, tomentose outside, sparsely pubescent within, attached to the tube of the calyx beneath the margin of the disk, tip thickened, inflexed. Disk thin, lining the calyx-tube, crenate. Stamens inserted on the tube of the calyx at the margin of the disk between the crenatures; filaments slightly hairy. Style long, stout, hairy; stigma capitate, 5-lobed. Drupes black, fleshy, size of a gooseberry, edible; pyrenes 1-3 (commonly 2), bony, rugose. Seed with a membranous wing.

Distribution: Widely distributed throughout India and Burma, chiefly in mixed deciduous forests.

In Salsette, near Bombay, the juice of the stem is dropped into the eye to cure opacities of the conjunctiva; the fruit is pickled and eaten as a cooling and stomachic remedy. In the Konkan, the juice of the leaves, with that of the leaves of *Adhatoda vasica* and *Vitex trifolia*, mixed with honey, is given in asthma.

In Indo China the juice of the leaves, mixed with honey, is prescribed in asthma.

In the Philippine Islands the root is given as a decoction in the treatment of pulmonary affections.

Almora: Titmer—; *Assam:* Gendelipoma—; *Banda:* Gurja—; *Bengal:* Dabdabe, Jum, Nil bhadi, Tum karphat—; *Bhumij:* Karur—; *Bombay:* Kakad, Kanghur, Kurak—; *Burma:* Chinyok, Chinyop, Hsen-youk—; *Canarese:* Aranelli, Biligadde, Doddadumpli, Gadde, Hallubolige, Nelligadde, Sudhikanne—; *Central Provinces:* Ghunja, Kaikra, Kankar, Maharut—; *Deccan:* Kanghur, Kurak—; *Garo:* Chitopoma—; *Gond:* Gharri, Gupni, Kekra—; *Gujerati:* Kancodd, Kusimb—; *Hasada:* Armudoka—; *Hindi:* Ghogar, Kaikar, Kharpat, Tum—; *Indo China:* Dau heo, Dok sa khan, Mong heo—; *Kathiawar:* Karapti—; *Kharwar:* Kekur—; *Khond:* Sompotridope—; *Kolami:* Armu, Nia jowa—; *Konkani:* Halabalage, Kakad, Kusimba—; *Kumaon:* Katula, Kharpat, Kilmira, Kitmira, Sarota—; *Kurku:* Kekkeda—; *Lepcha:* Maldit—; *Maghi:* Mroung-shisha—; *Malayalam:* Karuvempu, Kareyam, Kattukalinjan—; *Mal Paharia:* Kosramba—; *Marathi:* Kakad, Kudak, Kuruk—; *Melghat:* Kekda—; *Michi:* Gia—; *Naguri:* Armudaru—; *Nepal:* Auledabdabe, Dabdabbi—; *North-Western Provinces:* Gurja, Kharpat—; *Oudh:* Ghogar, Kaikar, Karolu—; *Punjab:* Karpat, Katula, Kilmira, Sarota—; *Ramnagar:* Titmer—; *Santal:* Kandwer, Karur—; *Saora:* Garugudu—; *Tamil:* Arunelli, Karuvembu, Karuvilangam, Malaiyudi, Vilangam, Yennaikkarai—; *Telugu:* Garuga, Kondavepa—; *Tulu:* Kadambate—; *Uriya:* Handulomohi, Kikodu, Mohi, Nibrymohi, Sompotri, Sorupotri—.

COMMIPHORA Jacq.
(BALSAMODENDRON Kunth)

Balsamiferous trees or shrubs; branches often spinescent. Leaves membranous, 3-foliolate, sometimes with very small lateral leaflets,

or imparipinnate; leaflets sessile or shortly petioluled, small, crenate or serrate, rarely entire. Flowers polygamous, small fascicled, shortly pedicelled. Calyx cupular, urceolate or tubular, 4- (rarely 5-6-) toothed or lobed, persistent. Petals 4 (rarely 5-6), inserted on the margin of a more or less concave disk, oblong, erect, spreading or reflexed at the apex, valvate or induplicato-valvate. Stamens 8-10, inserted on the margin of the disk, the alternate usually longer, rarely equal; filaments dilated at the base; anthers ovate. Disk cupular. Ovary ovoid, sessile, 3- rarely 2-4- celled; ovules 2 in each cell; style short; stigma obtusely 3-4-lobed. Drupe ovoid or subglobose; epicarp 2-6-valved; pyrenes crustaceous or woody, connate into a compound pyrene, one cell seed-bearing, the rest barren.—Species 90.—Warm Asia and Africa.

1. Shrubby, 1.2-1.8 m. high. Leaves 1-3-foliate .... 1. *C. mukul.*
2. An unarmed shrub. Leaves 2-3 pairs with an odd one ...... 3. *C. stocksiana.*
3. Leaves alternate with generally a small leaflet .... 2. *C. agallocha.*

Balsamiferous trees which yield gum-resins known as bdellium and myrrh.

The following species are used medicinally in Senegambia—*C. africana* Engl.—; in Hausa—*C. africana* Engl., *C. myrrha* Engl., *C. pedunculata* Engl.—; in North-East Africa—*C. myrrha* Engl.—; in Arabia—*C. kataf* Engl., *C. opobalsamum* Engl.—; in Indo China *C. myrrha* Engl.—; in China—*C. myrrha* Engl.—; in East Africa—*C. africana* Engl., *C. caryaefolia* Oliv.—.

OFFICIAL:—" Myrrh " or gum-resin of *Commiphora sp.* of African origin (Switzerland); *Commiphora spp.* (Belgium, Germany, Great Britain, Holland, Japan, Spain, Sweden, Turkey, United States), *C. abyssinica* Engl. (Austria, France, Italy, Norway),—(Berg) Engler (Russia), *C. molmol* Engler (Germany, Turkey), *C. Myrrha* Holm. (Belgium, Great Britain), *C. Myrrha* (Nees) Baillon (United States), *C. opobalsamum* Engler (Italy), *C. Schimperi* Engl. (France, Italy, Norway).

1. **Commiphora mukul** Engl. in D.C. Monogr. IV (1883) 12.—*Balsamodendron Mukul* Hook. ex Stocks in Hook. Kew Journ. Bot. I (1849) 259, t. 8.—*B. Roxburghii* Stocks in Journ. As. Soc.

Bomb. II (1848) 391 (non Arnott).—PLATE 211 (under *Balsamodendron Mukul* Hook. ex Stocks).

Shrubby, 1.2-1.8 m. high; young parts glandular-pubescent; branches knotty and crooked, divaricate, usually ending in a sharp spine. Leaves 1-3-foliolate; leaflets subsessile (the terminal up to 20 by 8 mm.), rhomboid-ovate, serrate-toothed in the upper part (the tapering base entire), smooth, and shining, the lateral leaflets when present less than half the size of the terminal ones. Flowers in fascicles of 2-3; pedicles very short. Calyx campanulate, glandular-hairy; lobes 4-5, triangular, as long as the tube. Petals brownish red, broadly linear, nearly thrice the length of the calyx, reflexed at the apex. Stamens 8-10, alternately long and short, half the length of the petals. Disk 8-10-lobed, the alternate sinuses deeper and in these are inserted the shorter stamens. Ovary oblong-ovoid, attenuated into the style. Drupes red when ripe, 6-8 mm. diam., ovoid, acute; epicarp 4-valved; pyrenes ovate, acute, readily splitting into 2.

Distribution: Bellary, Mysore, Deccan, Khandesh, Kathiawar, Rajputana Desert, Sind, Baluchistan.—Arabia.

The gum is of five kinds. It is bitter, hot, acrid; laxative, stomachic, aphrodisiac, alterative, tonic, anthelmintic; causes biliousness; heals fractures, ulcers, fistula, piles—; removes "kapha", "vata", cures indigestion, urinary discharges, urinary concretions, leucoderma, tumours, inflammation, tubercular glands in the neck, "tridosha"; useful in ascites, asthma, and troubles of the chest; removes bad discharges from the ear.—The fruit cures abdominal troubles (Ayurveda).

The gum is bitter, acrid, with a bad odour; maturant, resolvent, expectorant, aphrodisiac; enriches the blood; useful in muscular rheumatism, lung complaints, dyspepsia, and piles (Yunani).

The gum is a demulcent, aperient, carminative, and alterative; especially useful in nervous diseases, scrofulous affections, urinary disorders and skin diseases.

It is applied locally as a paste in haemorrhoids, incipient abscesses, and bad ulcers.

It is also used as an expectorant.

The gum in combination with other drugs is prescribed in the treatment of snake-bite and scorpion-sting (Charaka, Sushruta).

The gum is useless in the antidotal treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

A chemical examination of the resin "Mahisakshi gugul" was carried out by Satyanarayana Naidu (14th Ind. Sc. Congress, 1927).

Arabic: Aflatan, Moql, Moqlearzaqi, Mukulearabi—; *Bengal:* Gugal, Guggul, Mukul, Ranghanturb—; *Canarese:* Guggala—; *Cutch:* Gugal—; *Deccan:* Gugal, Guggul, Mukul, Ranghanturb—; *Gujarat:* Gugal, Gugali, Gugar, Guggul, Mukul, Ranghanturb—; *Hindi:* Gogil, Gugal, Guggul, Mukul, Ranghanturb—; *Marathi:* Guggala, Gulag, Mukul—; *Persian:* Boejahudan—; *Porebunder:* Gugal, Gugali, Gugar—; *Sanskrit:* Bhavabhishtha, Bhutahara, Devadhupa, Deveshta, Dhurta, Divya, Durga, Guggulu, Jatala, Jatayu, Kalaniriyasa, Kaushika, Kumbha, Kumbhi, Kumbholu, Kumbholukhalaka, Kunti, Mahishaksha, Mahishakshaka, Marudishta, Nishadhaka, Palankasha, Pavandvishta, Pura, Puta, Rakshoha, Sarvasaha, Shambhava, Shiva, Uddipta, Ulukhalaka, Usha, Vayughna—; *Sind:* Gugal, Guggul, Mukul, Ranghanturb—; *Sinhalese:* Gugula, Jatayu, Javayu, Ratadummula—; *Tamil:* Gukkal, Gukkulu, Maishakshi—; *Telugu:* Gugul, Mahisaksh, Maisakshi—.

2. **Commiphora agallocha** Engler in DC. Monogr. IV (1883) 11.—*Balsamodendron Roxburghii* Arn. in Ann. Nat. Hist. III, 86.—*Amyris commiphora* Roxb. Fl. Ind. II, 244.

A small crooked tree with many spreading and drooping crooked branches, the short lateral branchlets often ending in thorny points. Bark of the young shoots green and smooth, that of the larger branches and trunk covered with a light coloured skin peeling off from time to time. Leaves alternate, petioled, oval or elliptic, serrulate, smooth on both sides, at the base or apex of the petiole on each side, there is generally a small leaflet, tending to give the whole the appearance of a ternate leaf. Flowers red, short-pedicelled, small, collected in little bundles on the small protuberant buds left by the previous year's leaves. Sepals, petals and stamens as in the genus. Glands 8,

alternate with the filaments. Drupe the size of a black currant, red, smooth. Nut 2-celled, with a single seed in each.

Distribution: Assam, Sylhet, E. Bengal.

The gum resin is used in the same ways and for the same purposes as that of *C. Mukul.*

Bengal: Gugala—; *Bombay:* Gugal, Mhaishabola—; *Canarese:* Agaru, Agilu, Guggala—; *English:* Indian Bdellium—; *Gujarat:* Gugal—; *Sanskrit:* Agaru—; *Saora:* Guggilu, Kaushika—; *Sind:* Gugar—; *Tamil:* Attam, Kukkula, Kungiliyam, Kungulu—; *Telugu:* Agaru, Bodanki, Guggilamu, Mahisakshi—; *Uriya:* Ogoru—.

3. **Commiphora stocksiana** Engl. in DC. Monogr. IV (1883) 17.—*Balsamodendron pubescens* Stocks in Journ. As. Soc. Bomb. II (1848) 395, t. 26.—Plate 212 (under *B. pubescens* Stocks).

An unarmed shrub, much resembling C. Mukul in general habit; branches not tipped with a spine; young shoots and leaves rusty-pubescent. Leaves 2-3 pairs with an odd one; leaflets entire, the terminal obovate, petioluled, the lateral subsessile, usually oblong-obovate. Flowers fascicled, 1-3 together, subsessile. Calyx urceolate; teeth short. Petals red or white, obovate, acute, spreading at the apex, not reflexed. Stamens equal in height. Disk equally toothed. Drupes red, subglobose, shortly pointed, marked by 4 conspicuous white sutures, the alternate ones not reaching to the apex, 2-valved, the valves semibifid.

Distribution: Sind, Baluchistan.

The gum obtained from this tree may be used in the form of ointment for cleansing and stimulating bad ulcers. It is a favourite application in Delhi sores, combined with sulphur, catechu and borax.

In Las Bela the gum is used as a cure for stomach ache (Hughes-Buller).

Baluchistan: Bai, Bayi—; *Las Bela:* Gugar—; *Marathi:* Bayisagugul—; *Tamil:* Malaikiluvai—.

1. **Canarium commune** Linn. Mant. I, 127.—PLATE 213.

A tree. Extremities of branches tawny puberulous or glabrate. Leaves alternate, imparipinnate, of flowering branches 25-45 cm. more or less; leaflets 7-9, ovate to oblong, elliptical, acuminate, glabrous, upper leaflets 10-15 by 3-6.5 cm., lateral nerves about 10-15 pairs; stipules elliptic or rotundate, auricled, often early deciduous. Petiolules 12-25 mm. long. Panicles terminal, puberulous, with spreading successively shorter lateral branches. Buds enclosed in ovate or rotundate, tomentose, deciduous bracts. Flowers variable in size, female 8 to over 12 mm. in length. Calyx campanulate, broadly 3-lobed. Petals 3, imbricate below, tomentose above. Stamens in male flowers inserted around the hairy rudiment of ovary. Ovary glabrous, thickened above. Drupe ellipsoidal, subtrigonous, with a bony 1-3-celled stone. Cotyledons tripartite, contorted.

Distribution: A native of the Moluccas.—Introduced and planted in India and the Malay Peninsula.

The gum is applied in the form of an ointment to indolent ulcers.

The fruit is fattening and laxative.

In Cambodia the tuber is considered stimulant, bechic, diaphoretic, and styptic; it is prescribed internally for chronic bronchitis, liver trouble with jaundice, cephalalgia, vertigo, and inflammation of the uterus; externally it is used in the preparation of sinapisms employed in liver complaints, neuralgia, and rheumatism.

Cambodia: Romdeng—; *Canarese:* Kagga libija, Kaglimaram, Javabadami, Sambrani—; *Cutch:* Jangali bedana—; *English:* Java Almond Tree—; *French:* Canari, Canaris—; *Hindi:* Jangali badam—; *Malayalam:* Canari, Karaichingasi—; *Papua:* Keanee—; *Sinhalese:* Ratakakana, Ratakekuna—; *Spanish:* Arbol de la brea—; *Tagalog:* Pilipilauay—.

2. **Canarium strictum** Roxb. Hort. Beng. (1814) 49.—PLATE 214.

A large tree; young branches and leaves beneath densely rufous-tomentose. Leaves coriaceous, shining and glabrous above, reaching 0.6-1.2 m. in length; leaflets 3-7 pairs and an odd one, 10-20 by 4.5-9 cm., ovate-oblong or ovate, to ovate-lanceolate, acuminate,

opposite or alternate, finely serrate, with 10-15 pairs of lateral nerves very prominent beneath; petiolules 2.5-8 mm. long. Flowers in short-branched axillary panicles shorter than the leaves; pedicels very short. Calyx usually 3-lobed, cupular, rusty-tomentose outside; tube 3 mm. long; lobes triangular, 1 mm. long. Petals 6 mm. long by 2 mm. broad, oblong-obovate, slightly hairy on the outside towards the rounded apex. Ovary ovoid, attenuated into a style as long as the ovary, glabrous, rudimentary in the male flowers. Drupes 3.8-5 cm. long, ellipsoid, or ovate, tapering at both ends; stone hard, bony.

Distribution: Konkan, W. Ghats of N. Kanara and of Madras Presidency in moist evergreen forests, up to about 5,000 ft.

The gum is used with gingelly oil in rheumatic pains.

Bengal: Kala dammar—; *Bombay:* Dhup, Gugul—; *Canarese:* Halemaddu, Karedupa, Mandadupa, Pandu, Raladupa—; *English:* Black Dammar Tree—; *Gujarat:* Kala dammar—; *Hindi:* Kala dammar—; *Kadir:* Kungiliam, Tubam, Viraka—; *Malayalam:* Karuttukungiliam, Kungiliam, Kunturukkapayam, Pantam, Telli—; *Marathi:* Dhup, Raldhup—; *Sanskrit:* Mandadhupa, Raladhupa—; *Tamil:* Attam, Karungundurukkam, Karunkungiliyam, Karupudamar, Karuppukkungiliyam, Kundurukkam, Kungiliam, Kukkil Kungulu—; *Telugu:* Nallarojanamu.

3. **Canarium bengalense** Roxb. Hort. Beng. (1814) 49; Fl. Ind. III, 136.—Plate 215.

A tall tree. Extremities of branches rusty-pubescent, glabrate. Leaves 30-60 cm., long, leaflets 13-21, subopposite, 7.5-15 by 2.5-5 cm., ovate-oblong or lanceolate-acuminate. Stipules subulate. Panicles racemiform, shorter than or equalling the leaves. Calyx cupuliform, 3-fid. Petals 3, imbricate, obovate-oblong. Filaments confluent half their length. Disk hirsute within the stamens. Drupe size of a large olive, ellipsoidal, smooth, 1-3-celled, dark purple pruinose; stone trigonous, thick, bony. Cotyledons contortuplicate.

Distribution: Assam, Sylhet.

The leaves and bark are used externally for rheumatic swellings.

Assam: Bisjang, Dhuna—; *Garo:* Tekreng—; *Lepcha:* Narockpa—; *Nepal:* Goguldhup—.

MELIACEAE.

Trees or shrubs. Leaves alternate; usually pinnate, rarely simple or bipinnate; leaflets opposite or alternate, generally oblique at the base; stipules 0. Flowers regular, hermaphrodite or polygamo-dioecious, in treminal or axillary panicles. Calyx usually small, 3-6-lobed, rarely entire or with free sepals, usually imbricate. Petals 3-6, free or rarely connate at the base, sometimes adnate below to the staminal tube, valvate imbricate or contorted. Disk or annular, free or adnate to the ovary or obsolete. Stamens 4-12; filaments connate in a tube or rarely free; anthers erect, usually sessile on the tube, included or exserted, 2-celled, longitudinally dehiscing. Ovary usually free, 2-5-celled, style simple; stigma disciform or capitate; ovules 2, rarely more, collateral or superposed, rarely solitary. Fruit dehiscent or indehiscent, capsular baccate or drupaceous. Seeds sometimes arillate, sometimes winged; exalbuminous or with fleshy albumen, embryo usually flat, cotyledons fleshy.—Genera 40. Species 600.—Warm regions.

A. Leaflets often toothed. Stamens united into a tube. Cells of ovary 1-2-ovuled. Seeds not winged. Albumen thin, fleshy. Cotyledons thin, foliaceous
- I. Leaves simple .... TURRAEA.
- II. Leaves trifoliolate, pinnate or 2-3-pinnate Flowers elongated. Style long
  - a. Petiole winged. Ovules collateral .... NAREGAMIA.
  - b. Common petiole not winged
    - 1. Flowers elongate. Fruit drupaceous .... MELIA.
    - 2. Flowers and staminal tube oblong, Style long. Disk absent. Petals 5 .... AZADIRACHTA.

B. Leaflets entire. Stamens united into a tube. Cells of ovary 1-2-ovuled (2-5-ovuled in Carapa). Seeds not winged. Albumen absent. Cotyledons thick
- I. Flowers and staminal tube oblong or linear. Style elongated

a. Capsule loculicidal. Leaves pinnate
Flowers oblong. Anthers short. Ovules 2 together, rarely solitary .... DYSOXYLUM.
b. Berry indehiscent. Leaves trifoliolate .... SANDORICUM.
II. Flowers and staminal tube globose or turbinate. Style short or obsolete
a. Anthers included in the staminal tube or nearly so. Ovules 1-2 together. Seeds not angular
1. Anthers 5, isomerous .... AGLAIA.
2. Anthers 6-10. Flowers diplostemonous
Capsule loculicidal .... AMOORA.
3. Anthers 3 or 6 .... APHANAMIXIS.
b. Anthers exserted or filaments free. Ovules 1-2 together. Seeds not angular
Seeds arillate. Calyx 4-5-fid. Flowers small
1. Berry indehiscent, shortly tomentose .... WALSURA.
2. Capsule loculicidal, glabrous .... HEYNEA.
c. Anthers included. Ovules 2-8 together. Seeds angular .. CARAPA.
C. Stamens united into a tube. Cells of ovary with numerous ovules Seeds not winged
I. Petals obovate, spreading. Staminal tube cup-shaped. Disk wide. Ovary 5-celled .... SOYMIDA.
II. Petals oblong, erect, patent. Staminal tube cylindrical. Disk obsolete. Ovary 3-celled .... CHUKRASIA.
D. Stamens distinct. Cells of ovary 8-12-ovuled
I. Petals oblong, erect. Stamens 4-6, sometimes with alternating staminodes. Ovary 5-celled .... CEDRELA.
II. Petals unguiculate, spreading. Stamens 10. Ovary 3-celled .. CHLOROXYLON.

They are more or less acrid, bitter, and astringent; many are tonic, stimulant, and antiperiodic; others are emetic and cathartic.

Two alkaloids, margonine and chloroxylonine, have been isolated.

TURRAEA Linn.

Trees or shrubs. Leaves alternate, petioled, entire or obtusely lobed. Flowers in axillary clusters or short racemes, bracteate. Calyx 5-4- toothed or -partite. Petals 5-4, elongate, free, contorted. Staminal tube cylindric, toothed at the apex; anthers 10 or 8, short, included or exserted, inserted just within the mouth, alternating with the teeth. Disk annular or obsolete. Ovary 5- (or more-) celled; ovules 2 in each cell, superposed; style filiform, thickened at the apex; stigma discoid or capitate. Capsule 4- (or more-) celled, cells 1-2-seeded, 5- or many- valved; valves woody or coriaceous, separating from the winged axis. Seeds oblong, with a broad ventral hilum,

the margins sometimes winged; albumen fleshy; embryo curved; cotyledons foliaceous; radicle terete.—Species 50.—Palaeotropics.

T. heterophylla Smith is used medicinally in the Gold Coast, *T. virens* Linn. in the Philippine Islands, *T. floribunda* Hochst. and *T. obtusifolia* Hochst. in South Africa.

1. **Turraea villosa** Benn. Pl. Jav. Rar. (1840) 182; Wight Ic. t. 1593.—PLATE 216.

A large shrub. Leaves membranous, appearing after the flowers, 5-10 by 3-5.5 cm. (when mature), elliptic or ovate, acuminate, entire, softly villous when young, becoming more or less glabrous when old, base acute or rounded; petioles 6-10 mm. long, pubescent. Flowers axillary, 3.8-5 cm. long, solitary or in fascicles of 2-6, or in short-peduncled umbels; buds clavate. Calyx campanulate, pubescent outside, 5-toothed; teeth triangular. Petals yellow, linear-spathulate. Staminal tube reaching 2.5 cm. in length, glabrous; teeth very short; anthers longer than the teeth of the staminal tube. Ovary 5-celled; style long, far-exserted; stigma large, ovoid. Capsule subglobose, about 1.2 cm. diam., glabrous.

Distribution: Bombay Presidency: Gujarat, Konkan, W. Ghats, N. Kanara. Madras Presidency: W. Ghats in the Anamalai Hills up to 4,000 ft.. hills of Travancore,—Java.

The root is used as an application to fistulas and is administered internally in leprosy.

Bombay: Kapurbhendi—.

NAREGAMIA Wight & Arn.

Species 1.—India.

1. **Naregamia alata** Wight & Arn. Prodr. (1834) 117; Wight Ic. t. 90.—PLATE 217.

A small branching undershrub. Leaves alternate, 3-foliolate, petiole winged. Flowers solitary or 2 together, axillary. Calyx 5-lobed, imbricate. Petals 5, free, elongate, linear-spathulate. Disk annular. Staminal tube long, slender, cylindric below, inflated near the top and sometimes cleft in 2 parts, obscurely 10-crenate at the mouth; anthers 10, appendaged at the apex. Ovary 3-celled;

style filiform; stigma capitate; ovules 2 in each cell, collateral, pendulous. Fruit an ovoid-globose capsule, loculicidally 3-valved, the valves separating from the 3-winged axis, the cells 2-seeded. Seeds pendulous, curved, truncate at both ends, muricate, with a short double membrane along the side next the axis; albumen fleshy; cotyledons flat, foliaceous.

Distribution: Konkan, N. Kanara, W. Ghats of Madras Presidency in all districts up to 3,000 ft.

The root is sweet and cooling; alexiteric, vulnerary; cures asthma, bronchitis, biliousness, ulcers (Ayurveda).

In the Konkan the leaves and stem are given in decoction with bitters and aromatics as a remedy for biliousness.

The root is a good emetic and cholagogue. It has been found useful in acute dysentery and as an expectorant.

In Southern India the plant is used in rheumatism and itch.

Canarese: Belakanji, Nelanaringa—; *English:* Goanese Ipecacuanha—; *French:* Ipecacuanha de Goa, Narégamia ailé—; *Goa:* Trifolio—; *Malayalam:* Nilanarakam—; *Marathi:* Kapurbhendi, Pitmari, Pitpapra, Pitvel, Timpani—; *Sanskrit:* Amlavalli, Brihatpatra, Chhinnagrantika, Drumaruha, Kandabahula, Kandalu, Triparnika—; *Saora:* Pagapapu—; *Tulu:* Nelakanji—; *Uriya:* Pittamari—.

AZADIRACHTA A. Juss.

Species 1.—Indo-Malayan.

1. **Azadirachta indica** A. Juss. in Mém. Mus. Par. XIX (1830) 221; Wight Ic. 2. 17.—*Melia Azadirachta* Linn. Sp. Pl. (1753) 385.—*Melia indica* Brandis For. Fl. 67.—PLATE 218 (under *M. Azadirachta* Linn.).

Tree. Leaves alternate, imparipinnate; leaflets subopposite serrate, very unequal at base. Flowers hermaphrodite, in axillary panicles. Calyx 5-lobed. Petals 5, much exceeding the calyx, free, imbricate. Disk 0. Staminal tube a little shorter than the petals, cylindric, widening above, 9-10-lobed at the apex, the lobes truncate, again slightly toothed; anthers within the tube opposite to and shorter

than the lobes. Ovary 3-celled; style elongate, slender; stigma shortly cylindric, 3-lobed; ovules 2 in each cell, collateral. Fruit a 1-seeded drupe, endocarp woody. Seed ellipsoid; albumen 0; cotyledons thick, fleshy, cordate at base; radicle superior.

Distribution: Wild in the dry regions of the Irawadi valley. Cultivated and naturalized in the Punjab to the Jhelum, west of the Sutlej rare.

The bark is bitter; refrigerant, anthelmintic, maturant, pectoral, astringent; relieves "kapha" and "pittadosha", vomiting, burning sensation near the heart, fatigue, fever, thirst, bad taste in the mouth, cough; cures ulcers and inflammations; good for leprosy, blood complaints, urinary discharges; recommended for children; causes loss of appetite.—The leaves are anthelmintic, alexeteric, insecticidal; good in ophthalmia, biliousness, and skin diseases.—The tender young leaves are astringent; cause "vata", good for eye and skin diseases, and in leprosy.—The old leaves cure ulcers quickly.—The young branches are anthelmintic; good for cough, asthma, piles, tumours, urinary discharges.—The flowers are bitter; anthelmintic; remove "kapha" and biliousness.—The unripe fruit is oily and bitter; hot, purgative, anthelmintic; cures urinary discharges, skin diseases, tumours, piles, toothache.—The ripe fruit has the same properties as the unripe one; it is also useful in consumption, and in eye diseases.—The oil from the seeds is bitter; anthelmintic, alterative; good for skin diseases.—The juice of the leaves is useful in biliousness, and cures snake-bite (Ayurveda).

The bark is tonic, antiperiodic; useful in amenorrhoea.—The leaves are carminative and expectorant; lessen inflammation, earache, rheumatism; useful in syphilitic sores, boils, in all blood impurities; a decoction as an errhine relieves nose troubles; heals wounds; good as a gargle in stomatitis and for bad gums.—The bark and the leaves are anthelmintic, aphrodisiac, maturant, and resolvent; useful in leucoderma, lumbago, piles, syphilis, earache; cure all wounds; reduce all inflammations.—The flowers are stimulant and stomachic.—The seeds are good for the treatment of leprosy (Yunani).

The bark, root-bark, and young fruit are tonic and antiperiodic; they are useful in some slight cases of intermittent fever and general

debility. The root-bark is more active and speedy in its action than the bark and young fruit.

A strong decoction of the fresh leaves is a slight antiseptic, and is useful like a weak carbolic lotion in washing wounds and ulcers, and syringing out the vagina in the after-treatment of parturition, &c. When the pustules of small- or cow- pox burst and begin to ulcerate, the Hindu medical practitioners invariably recommend the application of the paste of the fresh margosa leaves two or tree times in the twenty-four hours, and speak highly of its healing power. The use of the paste is quite justifiable in many slight and ordinary cases of ulceration from the pustules of small- or cow- pox. The aroma of the fresh or recently dried leaves is sufficient to prevent the attack of insects, and they are therefore often placed in books and clothes by the natives of this country; but they are much inferior to camphor in this respect.

The bark, gum, leaf and seed are prescribed in combination with other drugs for the treatment of snake bite (Charaka, Sushruta, Vaidyavinoda, Yogaratnakara, Rasaratnakara, Vrindamadhava) and scorpion sting (Charaka, Haritasamhita, Subodhavaidyaka). The leaves are a popular remedy for scorpion sting.

The dried leaves powdered are applied locally to the anus of children suffering from intestinal worms.

The flowers are useful in some cases of atonic dyspepsia and general debility.

The gum is a demulcent tonic useful in catarrhal and other affections accompanied by great debility.

The sap is considered a refrigerant, nutrient and alterative tonic. It appears to have been of service in some chronic and long-standing cases of leprosy and other skin diseases, consumption, atonic dyspepsia and general debility.

The oil is a useful local remedy in some chronic forms of skin diseases and ulcers, by stimulating and exciting a healthy action. Applied to foul and sloughing ulcers, it retards the sloughing process to some extent, prevents the production of maggots, and dislodges them if already produced.

The oil is a universal external application for rheumatism, and

is taken internally by women in pregnancy. It is also antiseptic and commonly used for animals, both internally and externally.

The dry nuts possess almost the same medical properties as the oil, but they require to be bruised and mixed with water, or some other liquid before they can be applied to the skin or ulcers.

Major D. B. Spencer in his "Record of Indian Fevers, 1899" writes concerning the therapeutic uses of Neem:—"I have used the leaves, bark, and oil of Neem. All parts of the plant are medicinal.

1. Leaves. A handful of leaves, crushed and flattened, will make an excellent poultice for boils and sores; its action is stimulant and antiseptic.

The dried leaves I have used to preserve books and clothes from vermin.

Internally, two ounces of fresh leaves, made into an infusion, with a pint of boiling water, form an exceedingly useful bitter vegetable tonic and alterative. It has a marked action upon the liver —the stools often become brilliant yellow in colour after its use.

This infusion is also valuable in chronic malarial fever, although not so efficacious as the oil. In chronic syphilitic affections it acts as a powerful alterative. I have used it also in leprosy, but except perhaps in one case, it had no specific effect upon the disease.

2. The bark has astringent, antiperiodic and alterative properties and may be used as an infusion in the same way as the leaves.

3. The oil, I think, is the most active medicinal part of the plant. Externally, it has stimulant, antiseptic and alterative properties and is very useful in chronic syphilitic sores and indolent ulcers, which show no tendency to heal. If the effect of the pure oil be found too stimulating, it should be diluted with equal parts of some bland oil or even a weaker strength may be necessary.

The oil is also extremely useful as a parasiticide in various cutaneous affections, such as ringworm, scabies and others, where the presence of any kind of parasite may be suspected. It rapidly destroys the parasite and induces a healthy action. When the parasite is in the deeper layers of the skin, it will be necessary to rub the oil

well in for perhaps 10 minutes or more at a time. I have used this oil in mange in dogs and found it useful.

Internally, the oil in 5-10 minim doses, once or twice a day, is useful in chronic malarial fevers, in syphilis, leprosy and other diseases where an alterative action is indicated. I have used it internally for the last 12 years, chiefly in chronic malarial fevers, and have no hesitation in saying that it is a drug of undoubted value in these fevers."

A tincture of the bark of the stem was administered to cases of malarial fever as an antiperiodic and was found to be useful. A decoction of the root bark was also tried in malarial fever and was found to be equally efficacious. An essence in doses varying from 1 to 10 drops in water was given in chronic skin diseases, such as itch, boils, eczema; the drug improved the general condition of the patients and thereby indirectly assisted other methods of treatments adopted in those diseases (Koman).

All the parts of the plant whether given internally or applied externally are equally useless in the treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

Both the leaves and the oil from the seeds are quite ineffective as anthelmintics (Caius and Mhaskar).

The leaves charred according to instruction given by local practitioners were found useless in the treatment of leprosy (Caius and Mhaskar).

The chemical composition of the oil has been the subject of much study. Its bitter principle has been isolated and examined by Watson, Chatterjee and Mukherjee (*Journ. Soc. Chem. Ind.;* 1923) and by Sen and Banerjee (*Journ. Ind. Chem. Soc.;* 1931).

The oil contains a characteristic acid, margosic acid, which belongs to the linolic acid series (Chatterji and Sen). The margosates are strongly antiprotozoal in their action. Clinical experience has proved the value of sodium margosate in the primary, secondary and tertiary stages of syphilis, also in parasyphilis and congenital syphilis (Chatterji and Ray).

According to Roy and Dutt no such acid as margosic acid was found to exist in any portion of the fatty acids derived from Neem oil.

No acid of the linolic acid series could be obtained (16th Ind. Sc. Congress; Madras, 1929).

The alkaloid "margosine" is to be found in the stem bark.

Baluchistan: Nim—; *Bengal:* Nim, Nimgachh—; *Bombay:* Bakayan, Balnimb, Nim—; *Burma:* Bawtamaka, Kamaka, Tamabin, Thamaka, Thin, Thinborotamakha—; *Cambodia:* Sdao—; *Canarese:* Bemu, Bevina, Bevu, Kaybevu, Kaypebivu, Nimba, Ollebevu—; *Central Provinces:* Limbo—; *Cochin-China:* Cha do—; *Deccan:* Nim—; *English:* Indian Lilac, Margosa Tree, Neem Tree—; *French:* Agem lilas, Arbre à chapelets, Arbre saint, Azadirac de l'Inde, Azédarac ailé, Azédarach, Jasmin de perse, Laurier grec, Lilas des Antilles, Lilas de Chine, Lilas des Indes, Lilas de Perse, Lotier blanc, Lotier à feuilles de frêne, Margosier, Margousier, Patenotier d'Italie, Faux sycomore—; *German:* Grossblaettiger Zedrach—; *Gujarat:* Danujhada, Kohumba, Libado, Limba, Limbado, Limbra—; *Hindi:* Balnimb, Nim, Nimb, Ninb—; *Indo China:* Sau dau, Sdao, Xoan dau—; *Kolami:* Nim—; *Konkani* Nim—; *Kumaon:* Betain, Nim—; *Lambadi:* Lemalo—; *Malayalam:* Arytikta, Aryaveppu, Nimbam, Pisumarddam, Rajaveppu, Veppu—; *Marathi:* Balantanimba, Kadukhajur, Limba, Limbachajhada, Nimbay—; *Palamow:* Agas—; *Persian:* Azaddarachtehindi, Neeb, Nib—; *Portuguese:* Amargoseira, Margosa, Nimbo—; *Punjab:* Bakam, Bukhain, Drekh, Mahanim, Nim—; *Sanskrit:* Arishta, Arkapadapa, Chhardana, Chhardighna, Hingu, Kaitarya, Kakaphala, Kireshta, Kitaka, Malaka, Neta, Nimba, Nimbaka, Niryasa, Niyamana, Pakvakrita, Paribhadhraka, Pichumanda, Pitasara, Prabhadra, Pukamalaka, Puyari, Rajabhadraka, Ravipriya, Sarvatobhadra, Satiktaka, Shirshaparna, Shita, Shukrapriya, Subhadra, Sumana, Varatvacha, Vishirnaparna, Vranasodhakari, Yavaneshta—; *Santal:* Nim—; *Sind:* Nimuri—; *Sinhalese:* Kohumba, Nimbunimbagaha—; *Tamil:* Arulundi, Kaduppagai, Kinji, Malugam, Niriyasam, Pisidam, Sengumaru, Ukkragandam, Vembu, Veppu, Varuttam—; *Telugu:* Nimbamu, Taruka, Vemu, Vepa, Yapa, Yeppa—; *Tulu:* Bevu, Kaybevu—; *Urdu:* Neem—; *Uriya:* Kakopholo, Limbo, Nimbu, Nimo—;

Melia Linn.

Trees or shrubs. Leaves alternate, simply or 2-3-pinnate with an odd one, the young ones often stellately tomentose; leaflets toothed, serrate or entire. Flowers hermaphrodite, elongate, in large many-flowered axillary much-branched panicles. Calyx 5-6-partite, imbricate. Petals 5-6, free, much exceeding the calyx. Staminal tube a little shorter than the petals, laciniate, the mouth dilated; anthers 10, within the staminal tube at its apex, sessile, between its laciniae, erect. Disk annular. Ovary 5-8-celled; cells opposite the sepals; ovules 2 in each cell, superposed; style cylindric, much exceeding the ovary; stigma capitate. Drupe subfleshy; endocarp woody; cells 1-seeded. Seeds pendulous, elliptic; testa crustaceous; albumen fleshy or scanty; cotyledons foliaceous; radicle terete, superior.—Species 15.—Palaeotropics and subtropics.

1. Flowers lilac. Anthers nearly equalling the teeth of the purple staminal tube .... 1. *M. azedarach.*
2. Flowers white. Anthers exceeding the teeth of the white staminal tube .... 2. *M. composita.*

The genus is therapeutically important with well-marked tonic and stimulant, cathartic and emetic, antiseptic and anthelmintic properties.

The following are used medicinally in Syria and Persia—*M. azedarach* Linn.—; in Indo China and China—*M. azedarach* Linn.—; in Japan—*M. toosendan* Sieb. & Zucc.—; in the Philippine Islands—*M. azedarach* Linn., *M. candollei* Juss., *M. dubia* Cav.—; in the Malaya Archipelago and Tahiti—*M. azedarach* Linn.—; in La Reunion—*M. azedarach* Linn.—; in North and South America—*M. azedarach* Linn.—.

1. **Melia azedarach** Linn. Sp. Pl. (1753) 384; Wight Ic. t. 160; Bedd. Fl. Sylv. t. 13.—*M. sempervirens* Sw. Prodr. Veg. 67.—Plate 219.

A tree reaching 12 m. Leaves impari-bi-(or sometimes tri-) pinnate, 23-45 cm. long; pinnae opposite or alternate; ultimate leaflets 3-11, opposite or nearly so, 1.2-5 by 0.6-2.5 cm., ovate or lanceolate, acuminate, obtusely serrate, sometimes lobed, glabrous

on both surfaces, slightly inequilateral at the base; petiolules short, slender. Flowers fragrant, lilac, in long-peduncled, axillary panicles which are shorter than the leaves and glabrous or sparsely puberulous; pedicels slender. Calyx pubescent outside, divided nearly to the base; lobes ovate-oblong acute, ciliolate. Petals 1.5 cm. long, oblong-lanceolate. Staminal tube purple, 8 mm. long, glabrous, slightly ribbed outside, faintly pubescent within, acutely 20-toothed; anthers sessile, glabrous, apiculate, 1 between each pair of teeth. Ovary glabrous, 5-celled. Drupe ellipsoid-globose, 4-seeded.

Distribution: Supposed to be indigenous in Baluchistan and the Jhelum valley in Kashmir.—Cultivated and naturalized throughout India, Burma and the Malay Peninsula. Occurs also in Persia and China.

The root is acrid, bitter; dry, cooling; astringent to the bowels; anthelmintic; removes "kapha" and biliousness, tumours, pain in the heart; useful in vomiting, leucoderma, belching, blood impurities; heals ulcers, headache, uterine pains after delivery; cures fever, burning sensations, urinary discharges, lung complaints, rat-bite poisoning (Ayurveda).

The leaves and the seeds are bitter; expectorant; used in enlargement of the spleen and in heart complaints; emetic, styptic, stop epistaxis; strengthen the teeth; allay inflammation; cure scabies and dry skin eruptions.—The oil from the seeds is a brain tonic, laxative, maturant; good for earache, piles, spleen and liver disorders, and inflammation; purifies the blood.—The flowers and leaves are diuretic, emmenagogue; relieve nervous headache and cold swellings (Yunani).

The Persian Lilac has long been used by the Arabs and Persians, who brought a knowledge of its virtues with them into India. They consider the root-bark, fruit, flowers, and leaves to be hot and dry, and to have deobstruent, resolvent, and alexipharmic properties. Thus, the flowers and leaves are applied as a poultice to relieve nervous headaches. The juice of the leaves, administered internally, is said to be anthelmintic, antilithic, diuretic, and emmenagogue, and is thought to relieve cold swellings and expel the humors which give rise to them.

In the Punjab, the seeds are prescribed in rheumatism, and in Kangra they are pounded and mixed with apricots as an external application for the same disease. In Bombay, strings of the seeds are suspended over doors and verandahs during the prevalence of epidemics to avert the disease. The oil is said to possess similar properties to that of the Nim.

In America, a decoction of the leaves has been employed in hysteria, and is believed to be astringent and stomachic. The leaves and bark are used internally and externally in leprosy and scrofula; while a poultice of the flowers is believed to have vermicide properties and to be a valuable remedy in eruptive skin diseases. The fruit has poisonous properties, but is used in leprosy and scrofula, and is worn as a necklace to avert contagion.

In Indo China, the fruit and the flower are considered stomachic, astringent and vermifuge. The kernel of the fruit is prescribed in certain forms of fever and in urinary troubles. The seeds are given in typhoid fever, retention of urine and pelvic pain.

In Tongking and in La Reunion, the green leaves are considered insecticide.

A decoction of the bark of this jungle Neem was used as a bitter tonic and antiperiodic in dyspepsia and malarial fevers respectively. It was found to be an efficient bitter tonic but had no anti-malarial properties (Koman).

Almora: Betain—; *Annam:* Cay sau dau, Cay xoan, Cay xoan dau, Chau mou, Hou lien, San dan, Xun lien, Yu mou—; *Arabic:* Ban, Habulban—; *Argentine Republic:* Paraiso—; *Assam:* Thamaga—; *Baluchistan:* Bakain, Bakaur—; *Bengal:* Ghoranim, Mahanim—; *Bombay:* Bakayan, Drek, Mahalimbo, Nimb, Vilayatinim—; *Brazil:* Cinamomo—; *Burma:* Kamaka, Tamaka—; *Canarese:* Arebevu, Bevu, Garudabevu, Huchubevu, Sikkabevu, Vishabevu—; *Central Provinces:* Mahalimbo, Mahanim, Muhli—; *Chinese:* Lien, Lien Chou—; *Cochin-China:* Faux camphrier, Faux sycomore, Sau dau—; *Congo:* Lilas des Falls—; *Deccan:* Goulinim, Gourinim—; *Dun:* Bakain, Dek—; *Dutch:* Onzevader-boom, Paternosterboom—; *English:* Barbados Lilac, Bead Tree, Indian Lilac, Persian Lilac, Pride of China, Pride of India—;

French: Agem lilas, Azédarac bipinné, Azédarac commun, Arbre ă chapelets, Jasmin de perse, Laurier grec, Lilas de Chine, Lilas des Indes, Lilas du Japon, Lilas de Perse—; *Garhwal:* Denkna—; *German:* Paternosterbaum, Zedrach—; *Guadeloupe:* Arbre ă chapelets, Arbre saint, Lilas du pays—; *Gujerati:* Bakanlimbodo—; *Hausa:* Kurnan nasara—; *Hindi:* Bakain, Bakarja, Bakayan, Betain, Deikna, Drek, Mahanimb—; *Indo China:* Dok hien, Kho luyen, Sau dau, Sdau, Xoan, Xoan trang—; *Japanese:* Senn dan, Sen yoo si, Shen lien—; *Jaunsar:* Deknoi—; *Kolami:* Garanim—; *Konkani:* Vilayatinimb—; *Kumaon:* Dainkan—; *Lambadi:* Turkalimma—; *La Reunion:* Grand lilas, Lilas de l'Inde—; *Madagascar:* Lilas de l'Inde, Voandelaka—; *Malayalam:* Malaveppu—; *Malay Archipelago:* Kakera, Kikera, Mindi—; *Malta:* Indian Lilac, Albero da rosari, Sigra tat-toscu—; *Marathi:* Bakananimb, Limbara, Vilayatinimb—; *Maxico:* Arbol paraiso, Lila, Paraiso morado—; *Mundari:* Bakainidaru—; *Nepal:* Bakain, Bakaina, Bakainu—; *New Caledonia:* Lilas—; *North-Western Provinces:* Bukain—; *Paraguay:* Paraiso—; *Persian:* Azadedarachta, Bakaen—; *Philippines:* Paraiso—; *Portuguese Africa:* Bombolo ia n'puto—; *Punjab:* Bakain, Chein, Dhek, Drek, Jek, Kachen—; *Pushtu:* Bakyana—; *Ramnagar:* Betun—; *Sadani:* Bakain—; *Sanskrit:* Akshadru, Brihannimba, Dreka, Gairika, Giripatra, Himadruma, Kaitarya, Kakanda, Karmuka, Keshamushti, Kshira, Mahadroksha, Mahanimba, Mahatikta, Nimbaka, Parvata, Pavaneshta, Ramyaka, Sakaleyaka, Shuklasaraka, Vishamushtika—; *Sind:* Bakayun, Drek—; *Sinhalese:* Lunumidella, Mahanimba—; *Spanish:* Acederaque, Cinamomo—; *Tabristan:* Takhak—; *Tahiti:* Tira—; *Tamil:* Malaivembu, Malaiveppam, Pisidam, Sigarinimbam, Tittam—; *Telugu:* Turakavepa, Vettiveppa—; *Tongking:* Cay Xoan—; *Uraon:* Bakain—; *Urdu:* Bakayana—; *Venezuela:* Alcli—.

2. **Melia composita** Willd. Sp. Pl. II (1799) 559.—*M. dubia* Hiern (non Cav.) in Hook. f. Fl. Brit. Ind. I, 545 (excl. *M. superba* Roxb.).—*Melia robusta* Roxb. Hort. Beng. (1814) 33.—PLATE 220 (under *M. dubia*).

A tall handsome tree; young branches densely clothed with

stellate pubescence, ultimately smooth. Leaves bi- sometimes tri-pinnate, 23-75 cm. long; ultimate leaflets 5-11, opposite, 2-7.5 by 0.6-3.8 cm. (the terminal the largest), from ovate-lanceolate to ovate-rotund, acute or acuminate, entire or crenulate, thinly stellately pubescent on both surfaces when young, at length glabrous, base acute or rounded, more or less oblique; main nerves 7-8 pairs; petiolules 3-6 mm. long. Flowers greenish white, 8 mm. long, fragrant, in stellately pubescent many-flowered branched panicles shorter than the leaves; peduncles long; pedicels short. Calyx stellately tomentose outside, deeply divided; lobes ovate, erect, ciliate. Petals 6 mm. long, linear-spathulate, concave, pubescent outside, puberulous within, ciliate. Staminal tube scarcely 6 mm. long, slightly expended at the mouth, 10-toothed (the teeth bifid), silky puberulous on both surfaces; anthers exserted, pubescent, longer than the teeth. Ovary glabrous, 5-celled; style a little longer than the staminal tube, overtopped by the apiculate anthers; stigma cylindric, 5-toothed, teeth erect. Drupes ovoid or ellipsoid, 2.5-3.8 cm. long, smooth, yellowish. Seed 1 in each cell, smooth, pointed.

Distribution: E. Himalaya up to 6,000 ft., Assam, W. Ghats and Below the Ghats to Tinnevelly, N. Circars, Ganjam, Deccan, Ceylon, Malay Peninsula.—Cochin-China, China, Java, Australia.

The fruit is bitter and nauseous; good for abdominal colic; useful as a cholagogue in malarial fevers (Ayurveda).

The pulp of the fruit has a bitter nauseous taste. It is a favourite remedy amongst the laboring classes for colic, half a fruit being the dose for an adult. It appears to have hardly any purgative properties, but is said to relieve the pain most effectively. In the Konkan, the juice of the green fruit, with a third of its weight of sulphur, and an equal quantity of curds, heated together in a copper pot, is used as an application to scabies, and to sores infested with maggots.

Assam: Dingkurlong—; *Bombay:* Eisur, Limbarra, Nimbarra, *Canarese:* Bettabevu, Bevu, Hebbevu, Kadubevu, Turukabemu, Turukabevu—; *Gujarat:* Kadukhajur—; *Malayalam:* Malaveppu—; *Marathi:* Kariaput, Nimbara—; *Nepal:* Lapshi—; *Sanskrit:* Arangaka—; *Sinhalese:* Limimidella—; *Tamil:* Malaivembu,

Turukkuvembu, Rurukkuveppu—; *Telugu:* Munnatikaraka—; *Tulu:* Korijelli—; *Uriya:* Mohalimbo, Potonolimbo—; *Visayan:* Bagaluga—.

DYSOXYLUM Bl.

Trees. Leaves large, alternate or rarely opposite, imparipinnate or abruptly pinnate; leaflets entire, opposite or alternate, oblique; stipules 0. Flowers hermaphrodite, paniculate. Calyx subentire or 4-5-lobed. Petals 4-5, oblong, spreading, valvate or slightly imbricate. Staminal tube cylindrical, dentate or crenulate at the mouth; anthers 8-10, included or half exserted, inserted below the apex of the staminal tube. Disk tubular or cup-shaped, as long as or longer than the ovary which it surrounds. Ovary free, 2-5-celled; attenuated into a long style; stigma broadly capitate; ovules 1-2 in each cell, superposed or collateral. Fruit a globose or pyriform 1-4-celled loculicidal capsule; valves coriaceous. Seeds without, rarely with, an arillus; testa coriaceous; albumen 0; cotyledons thick, fleshy; plumule often hirsute, enclosed between the cotyledons.—Species 140.—Indo-Malayan.

1. Leaflets 9-17. opposite or subopposite .... 1. *D. hamiltonii.*
2. Leaflets about 8. subopposite .... 2. *D. malabaricum.*

The bark has emetic, antiperiodic, anthelmintic, and emmenagogue properties.

The following are used medicinally in Indo China—*D. loureiri* Pierre—; in the Philippine Islands—*D. blancoi* Vidal, *D. schizochitoides* Turcz.—; in Java and Sumatra—*D. acutangulum* Miq., *D. aliaceum* Bl.—.

1. **Dysoxylum hamiltonii** Hiern in Hook. f. Fl. Brit. Ind. I, 548.—*Guarea Alliaria* Ham. in Mem. Wern. Soc. VI (1832) 305 (excl. syn. Rumph.).

A large tree; shoots tawny velvety. Leaves erect, pinnate, 40-50 cm. long; leaflets 10-18, opposite or subopposite, 10 by 3 cm., oblong, acuminate, very oblique, velvety on the midrib beneath; petiolules 3 mm. long. Panicles lax, axillary, 15 cm. long and wide, axillary, shorter than the leaves; pedicels slender, about equalling

or shorter than the flowers. Flowers 6 mm. long, greenish white, smelling strongly of garlic. Calyx very small, 4-partite, with rounded, concave, imbricated lobes, pubescent. Petals 4, glabrous. Staminal tube pubescent on both sides; anthers 8. Disk glabrous on both sides, twice the length of the ovary. Style slender, pubescent below, glabrous above. Ovary pubescent, 3-celled.

Distribution: Sikkim, Assam, Sylhet.

In Lakhimpur, Assam, the bark is used internally for pain in the stomach (Carter).

Assam: Bosuniyapoma, Gendellipoma—; *Garo:* Bolashin—; *Lepcha:* Sipochikung—; *Nepal:* Bauriphal, Chhalegach—.

2. **Dysoxylum malabaricum** Bedd. in Hook. f. Fl. Brit. Ind. I, 548.

A very large tree; young shoots slightly puberulous. Leaves up to 45 cm. long, abruptly-pinnate; rhachis angular; leaflets alternate or subopposite, 4-5 pairs, 10-23 cm. long, pale green, elliptic-oblong, acuminate, entire, puberulous when young; lateral nerves 12-20 pairs, prominent beneath; petiolules 6-13 mm. long. Flowers 8 mm. long, in axillary racemiform panicles shorter than the leaves; buds oblong; pedicels 8 mm. long. Calyx short, finely pubescent outside, deeply 4-lobed; lobes ovate, acute. Petals 4, linear-oblong, subacute, imbricate. Staminal tube urceolate, with 8 deep emarginate crenatures, contracted about two-thirds of the way up; anthers 8, alternate with the crenatures, included. Disk cupular, truncate, subentire or irregularly toothed, not concealing the ovary, pubescent within. Ovary densely pubescent, tapering into the style 4-celled; ovules 2 in each cell; stigma capitate, 4-lobed. Fruit 5 cm. in diam., pyriform, verrucose, bright yellow when ripe, 3-4-seeded. Seeds bluntly trigonous; testa reddish brown; cotyledons green.

Distribution: W. Peninsula.

A decoction of the wood is used in rheumatism. The oil is used in diseases of the eye and the ear.

Canarese: Bilibudlige, Bilidevadari—; *Kadir:* Purippa—; *Malayalam:* Vellakil—; *Tamil:* Vellaiyagil—.

SANDORICUM Cav.

Big trees. Leaves trifoliolate, coriaceous. Flowers in axillary panicles, pentamerous, imbricate. Calyx cup-shaped, tube adnate to the ovary base, lobes short. Petals oblong obtuse, recurved. Staminal tube cylindric, nearly as long as the petals, 10-toothed; anthers 10 or 8, included. Disk tubular embracing the ovary and base of the style. Ovary immersed in calyx-tube narrowed upwards to the columnar style, 5-celled; ovules 2 in each cell, collateral. Stigmas 5, erect. Berry globose, pericarp leathery, indehiscent, 3-5-celled. Seeds as many, with a sweet white translucent aril.—Species 7.—Mauritius, Indo-Malaya.

S. indicum Cav. is used in Indo China and throughout the Malay Archipelago, *S. vidalii* Merrill is also used in the Philippine Islands.

1. **Sandoricum indicum** Cav. Diss. VII, 359, tt. 202, 203; Roxb. Corom. Pl. III, 50, t. 261.—*Melia Koetjape* Burm. Fl. Ind. 101.—PLATE 221.

Tree, 12-24 m. tall, about 45-50 cm. through. Leaves 23-45 cm. long; petioles 7.5-10 cm. long; leaflets ovate or rounded, short acuminate, base rounded or subcuneate, glabrescent above, pubescent or glabrous except the nerves 8 to 12 pairs beneath, 10-20 cm. long, 5-12 cm. wide; petiolules 7.5-10 mm. long. Panicles 5-15 cm. long, many-flowered, more or less tomentose. Calyx subglabrous. Petals yellowish white, oblong-linear, obtuse. Staminal tube white, 5 mm. long, subglabrous outside, hairy within. Stigmas erect, not recurved. Fruit globose, 7.5 cm. through, yellow flushed red.

Distribution: Tropical forests of Pegu and Tenasserim.—Largely cultivated in Burma, the Malay Peninsula, the W. Peninsula and Ceylon.

The root is aromatic, stomachic, and antispasmodic.

In Java and in the Philippines, it is considered a powerful astringent and used as such.

The root, which is bitter, bruised with vinegar and water, is used by the Amboyans as a carminative and also in cases of diarrhoea and dysentery (Rumphius).

Burma: Thitto—; *English:* Malay Red Wood, Malay Sandal—; *Indo China:* Mangoustainer sauvage, Sau chua, Sau do, Sau tia—;

Java: Ketjapi, Sentoel—; *Malaya:* Santol, Santor, Sentol, Sentui—; *Tagalog:* Santol—; *Tamil:* Sayai, Sevai—; *Telugu:* Sevamanu—; *Visayan:* Santol—; *Zamboanga:* Santor—.

AGALAIA Lour.

Trees or shrubs, glabrous, lepidote, or stellately pubescent. Leaves alternate, pinnate; leaflets opposite, often oblique at the base, quite entire. Flowers polygamo-dioecious, minute, in axillary branching panicles. Calyx 5-toothed or 5-partite, imbricate. Petals 5, free, or more or less connate at the base, imbricate. Staminal tube urceolate or subglobose, 5-toothed or quite entire at the apex; anthers usually 5, or 4, or 10, included or half exserted, erect. Disk inconspicuous. Ovary 1-2- (rarely 3-) celled, short; ovules 1-2 in each cell; style thick, very short or 0; stigma scarcely broader than the style, 1-3-toothed. Berry 1- or few- seeded; pericarp coriaceous. Seeds with a fleshy integument.—Species 125.—Indo-Malaya, China.

A. baillonii Pierre and *A. pleuropteris* Pierre are used medicinally in Indo China.

1. **Aglaia odoratissima** Blume Bijdr. (1825) 171.—*A. Roxburghiana* Hiern in Hook. f. Fl. Brit. Ind. I, 555 (non Miq.).—*Miluca Roxburghiana* Wight & Arn. Prodr. I, 119; Wight Ic. t. 166.—PLATE 222 (under *A. Roxburghiana*).

Tree, 6-12 m. tall. Branchlets, petioles, rhachis, and inflorescence brown scaly. Leaves 12.5-23 cm. long; leaflets 5-7, oblong-lanceolate, or ovate, opposite, thinly coriaceous, bluntly acuminate, base cuneate, glabrous above, scaly beneath; nerves 6-9 pairs, slender, 5-15 cm. long, 2.5-6.3 cm. wide; petiolules 5 mm. long. Panicles 7.5-20 cm. long. Branches spreading, dense-flowered. Flowers depressed, globular, 1 mm. long, on pedicels as long. Calyx small, lobes 5, orbicular, scaly. Petals 5, elliptic or obovate, glabrous, much longer. Staminal tube truncate, campanulate. Fruit ovoid or subglobose, brown scaly.

Distribution: Mt. Abu, Konkan, S. M. Country, Deccan, N. Kanara, W. Ghats in S. Kanara and Malabar, Travancore, Tinnevelly, Ceylon, Burma, Malay Peninsula.—Sumatra, Java.

The bark is emetic; relieves "kapha" and "pitta".—The root is abortifacient.—The root and the bark are acrid, bitter; refrigerant, aphrodisiac, alexeteric; remove "vata" and biliousness, cure dysentery, leucoderma, skin diseases, leprosy; remove bad odours, excessive perspiration, burning fever, thirst, tumours, urinary discharges, vomiting, burning of the body, blood impurities.—The leaves are emetic and stop abdominal pain.—The flowers are useful in leprosy.—The fruit is sweet and acrid; heavy to digest; cooling and tonic; astringent to the bowels; heals ulcers; removes "kapha" and biliousness; useful in uterine complaints.—The seeds are sweet and acrid; cooling, dry, astringent to the bowels, tonic; remove biliousness and "kapha" (Ayurveda).

Bengal: Priyangu—; *Canarese:* Tottila—; *Hindi:* Priyangu—; *Malay:* Belankashutan, Subulatjantan, Tumilang—; *Malayalam:* Punyava, Sempuli—; *Sanskrit:* Anganapriya, Bhangura, Bhedini, Gandhaphala, Gauri, Gaurvalli, Govandini, Govarna, Gundra, Kanguni, Kanta, Karambha, Katu, Krishangi, Krishnapushpi, Lata, Mahilavhaya, Mangalya, Mithavalli, Narivallabha, Parnabhedini, Phalapriya, Phalini, Pita, Preyasi, Priyąka, Priyangu, Shubha, Shyama, Subhanga, Vanita, Vishvaksena, Vritta—; *Tamil:* Kannikkombu, Sokkalai—; *Telugu:* Ettanduga, Kondanduga—; *Uriya* Priyongo—.

APHANAMIXIS Bl.

Small trees or shrubs. Leaves imparipinnate; leaflets oblique. Male flowers in panicles, females in simple spikes or racemes on different plants, small. Sepals 5. Petals 3, concave, imbricate. Staminal tube subglobose; anthers 3 or 6. Disk small flat or conic. Ovary 3-celled. Capsule loculicidally dehiscent; pericarp coriaceous. Seeds arillate.—Species 8.—Indo-Malayan.

The genus has very little therapeutical value.

1. **Aphanamixis polystachya** Blatter, nov. comb.—*Amoora polystachya* Hook. f. & Jacks. Ind. Kew. (1895) 109.—*Aglaia polystachya* in Roxb. Fl. Ind. ed. Carey II (1824) 429.—*Andersonia rohituka* Roxb. Fl. Ind. II (1832) 213.—*Amoora rohituka* Wight

& Arn. Prodr. (1834) 119.—PLATE 223 (under *Amoora rohituka* Wight & Arn.).

An evergreen tree 9-18 m. high; young parts finely silky. Leaves large, imparipinnate, 30-75 cm. long; leaflets opposite, 4-8 pairs and an odd one, 7.5-23 by 3.4-10 cm., elliptic-oblong or oblong-lanceolate, acuminate, glabrous on both surfaces, very inequilateral, obtuse or acute at the base; petiolules 6-8 mm. long. Male flowers numerous, erect, 4 mm. long, subglobular, in solitary axillary panicles more than half as long as the leaves, the branches of the panicle about 7.5 cm. long spreading at right angles or slightly drooping; bracts beneath each flower small, scale-like; pedicels short. Calyx glabrous, 5-partite; lobes orbicular, ciliate. Petals 3, orbicular, concave, thick, glabrous, much larger than the calyx-lobes. Staminal tube nearly as long as the petals, subglobular, with a small opening at the apex, anthers 6, subsessile, elliptic-oblong, attached near the base of the tube, the tips just exserted. Female or hermaphrodite flowers larger than the male, in axillary or supraaxillary solitary spikes much shorter than the leaves. Calyx and petals as in the male, the anthers narrower. Ovary hairy, globular or ellipsoid; stigma 3-lobed. Fruit 2.5-3.8 cm. diam., globular, yellow when ripe, pericarp coriaceous, smooth, 3-celled, opening by 3 valves. Seed oblong with a scarlet aril.

Distribution: Sub-Himalayan tract from the Rapti river eastwards, Sikkim up to 6,000 ft., Assam, Burma, Chota Nagpur, Konkan, W. Ghats and adjoining hill ranges from the Poona District southwards to Tinnevelly up to 3,500 ft., Ceylon, Malay Peninsula, Andamans.—Cambodia, Indo-China, China, Malaya.

The bark is used in spleen and liver diseases, tumours, abdominal complaints.—The seeds are acrid with a sharp taste; refrigerant, laxative, anthelmintic; cure ulcers, diseases of the blood, of the eye and of the ear; lessen muscular pain (Ayurveda).

The bark of this plant is used as an astringent.

The ripe seeds yield an oil which is used as a stimulating liniment in rheumatism.

The powdered bark is said to be very beneficial in cases of enlarged spleen. It was administered to a case of enlarged spleen with no benefit. It was later administered to cases of enlarged spleen

and enlargement of liver of infants and the result was unsatisfactory (Koman).

Ramaswami Ayyar and Patwardhan have investigated the fixed oil from the seeds (17th Ind. Sc. Congress, Allahabad, 1930).

Annam: Goi muoc—; *Assam:* Amoraamari, Lotaamari, Raina—; *Bengal:* Pitraj, Tiktaraj—; *Burma:* Chayankayou, Thitni—; *Canarese:* Mukhyamuttage, Mullumuttaga—; *Gujerati:* Ragtarohido, Schvetarohido—; *Hindi:* Harinhara, Harinkhana—; *Kolami:* Sikakoro, Sikru—; *Lepcha:* Tangaruk—; *Madagascar:* Mafouraire de Madagascar—; *Malaya:* Kasaipaya, Pasaklingga—; *Malayalam:* Sem—; *Mal Paharia:* Okhioungza, Okhyang—; *Marathi:* Raktarohida—; *Nepal:* Bandriphal—; *Oudh:* Sohaga—; *Philippines:* Salaguinpula—; *Sanskrit:* Janavallabha, Ksharayogya, Lakshmi, Lakshmivana, Rohitaka, Saptavha, Sarvajanapriya, Sitanga, Sitapushpa, Sitavhaya, Shvetarohitaka, Shuklarohita—; *Sinhalese:* Hingalgass—; *Tamil:* Sem, Surailachumaram, Vangul—; *Telugu:* Chevamanu, Rohitaka—; *Tongking:* Hot goi—; *Visayan:* Agacac—.

AMOORA Roxb.

Trees, often large. Leaves usually imparipinnate; leaflets oblique. Flowers small, in axillary fascicles often unisexual in the same panicle. Calyx 3-lobed. Petals 3, short, concave, imbricate. Staminal tube subglobose or campanulate, entire or 6-10-toothed; anthers 6 or 10. Disk obsolete. Ovary sessile, 3-celled, cells 1- or 2- ovuled. Stigma sessile. Fruit capsular, subglobose; pericarp coriaceous or woody, 3-celled and 3-seeded, loculicidally 3-valved or indehiscent. Seeds with a coloured fleshy aril, usually only partly covering the seed.—Species 25.—Indo-Malayan and 1 in Australia.

A. aphanamixis Schult. is used medicinally in Java.

1. **Amoora cucullata** Roxb. Corom. Pl. III (1819) 54, t. 258.—*Aglaia cucullata* Pelegrin in Lecomte Fl. Indo-Chine I (1911) 771.—PLATE 224.

A tree 9-12 m. high. Leaves imparipinnate, 30-38 cm. long; leaflets 2-4 pairs and an odd one, opposite or subopposite, 7.5-18 by 3-6.3 cm., oblong-elliptic, subfalcate, subacute, glabrous on both

surfaces, base rounded very inequilateral except that of the terminal leaflet; petiolules 6-12 mm. long. Male flowers about 4 mm. long, in axillary lax branched sparingly lepidote panicles about equalling the leaves; peduncles long; pedicels short. Calyx lepidote outside, 3-lobed; lobes rounded, ciliolate. Petals 3, longer than the calyx, broadly elliptic, concave, glabrous. Staminal tube scarcely shorter than the petals, obovoid, irregularly and obtusely 5-7-toothed; anthers 6, attached half way up the tube. Rudimentary ovary stalked, ovoid-oblong, truncate, obscurely grooved. Female or hermaphrodite flowers a little larger than the male, in few-flowered supraaxillary racemes about 5 cm. long. Calyx, petals and staminal tube as in the male. Ovary lepidote, ovate, 3-angled, 3-celled; stigma sessile, large, 3-lobed. Fruit depressed, globular, 5-12.5 cm. diam., dehiscing by 3 valves; pericarp coriaceous. Seeds 3, rounded, trigonous, with an orange-coloured aril.

Distribution: Coast forests of Bengal, Burma and Malay Peninsula.—Borneo.

The leaves are bruised and applied to reduce inflammation.

Bengal: Amur, Latmi, Natmi—; *Burma:* Thitni—.

WALSURA Roxb.

Trees. Leaves 1-5-foliolate; leaflets usually opposite, entire. Flowers small, hermaphrodite, in axillary and terminal many-flowered panicles. Calyx short, 5-fid or 5-partite, imbricate. Petals 5, free, imbricate or subvalvate. Stamens 10 or 8; filaments linear or flattened, free or connate into a tube; anthers terminal, or inserted in the notch at the apex of the filament. Disk usually annular, fleshy. Ovary short, 2-3-celled, sunk in the disk; ovules 2 in each cell, collateral; style short; stigma turbinate-capitate, 2-3-toothed. Fruit baccate, shortly tomentose, indehiscent, 1- (rarely 2-) celled, 1-2-seeded. Seeds enclosed in a fleshy aril, exalbuminous.—Species 15.—Indo-Malayan.

W. pinnata Hassk. is used medicinally in Java; *W. elata* Pierre in Cambodia.

1. **Walsura piscidia** Roxb. Hort. Beng. (1814) 32.—PLATE 225.

A small tree; young parts glabrous. Leaves 3-foliolate; leaflets subcoriaceous, 5-9 by 2-3.2 cm., oblong-elliptic, obtuse, sometimes retuse, glabrous on both surfaces, shining above, paler beneath (the lateral leaflets opposite, very shortly petioluled, the terminal with a longer petiolule), base subacute. Flowers yellowish white, in corymbosely branched axillary or terminal panicles about equalling the leaves; buds globose; peduncles long, pubescent; bracts minute, triangular, caducous. Calyx small, pubescent outside; lobes ovate, acute. Petals 2.5 mm. long, ovate-oblong, acute, glabrous or puberulous outside, imbricate. Staminal tube half as long as the petals, hairy inside, equally 10-cleft for about two-thirds of its length, the divisions 2-toothed at the apex; anthers 10, acuminate, slightly hairy, inserted between the teeth and exceeding them. Disk large, annular. Ovary sunk in the disk; stigma 2-dentate. Berry 1-1.6 cm. long, ovoid, oblong or subglobose, bright orange-yellow when ripe, finely tomentose, minutely apiculate. Seed usually solitary, completely enveloped in a white juicy aril.

Distribution: W. Ghats from N. Kanara to the Anamalais, Pulneys and Travancore, Ceylon, N. Circars, Carnatic, Deccan.

The bark is stimulant and expectorant.

Bombay: Walasura, Wallursi—; *Burma:* Joeboe—; *Canarese:* Walurasi—; *Ceylon:* Chaddavakku, Kannakkampu, Vasasurai—; *Malayalam:* Perillappichu—; *Sinhalese:* Kirikon, Kerrekong, Molpetta—; *Tamil:* Cheddavakku, Kanjimaram, Malaivirali, Sattuvakku, Valasura—; *Telugu:* Ettavaludu, Valarasi, Valavadini, Vallarasi, Walurasi—.

HEYNEA Roxb.

Trees or rarely shrubs. Leaves imparipinnate; leaflets 5-11, opposite, petiolulate, entire. Flowers small, hermaphrodite, in long-peduncled terminal and axillary panicles. Calyx short, 4-5-lobed, lobes imbricate. Petals 4-5, free, oblong, suberect, subimbricate. Stamens 8-10, filaments connate more or less in a tube, linear,

2-toothed at apex; anthers ovate, attached between the teeth, mucronate. Disk annular, fleshy. Ovary sunk in the disk, 2-3-celled; style slightly obconic; stigma 2-3-toothed with a thickened base; ovules 2 in each cell, collateral, pendulous. Fruit a 1-celled, 2-valved capsule. Seeds surrounded by a fleshy white aril; testa membranous; albumen 0; cotyledons hemispheric, plano-convex; radicle superior. —Species 4.—Indo-Malayan.

H. trijuga Roxb. is used medicinally in Java.

1. **Heynea trijuga** Roxb. Hort. Beng. (1814) 33.—*Walsura trijuga* Kurz in Journ. As. Soc. Beng. XLIV, 2 (1876) 148; For. Fl. Burm. I, 225.—Plate 226.

A small tree reaching 9 m. Leaves 15-38 cm. long; common petiole with a thickened base; rhachis slender, glabrous; leaflets 2-6 pairs and an odd one, 6.3-14 by 2.5-6.3 cm., ovate-oblong or oblong-lanceolate, acuminate, glabrous above, glaucous and pubescent or glabrous beneath, base rounded or acute; petiolules 3-22 mm. long, the terminal ones the longer. Flowers about 4 mm. long, white, in corymbosely branched panicles nearly as long as the leaves; peduncles very long, slender, glabrous; bracts linear-lanceolate, caducous. Calyx with a few scattered hairs on the outside; lobes ovate, subacute. Petals much longer than the calyx with a thickened midrib and membranous finely ciliolate margins. Staminal tube shorter than the petals, split for about two-thirds of its length, the lobes linear, 2-dentate, slightly hairy outside, densely so within; anthers between the teeth of the lobes, about equal to them in length or a little longer, slightly mucronate. Ovary glabrous; style slightly obconical; stigma 2-dentate, with a thickened ring at the base. Capsules 8-12 mm. long, ovoid or subglobose.

Distribution: Sub-Himalayan tract from Kumaon eastward, Sikkim up to 4,000 ft., Khasia Hills, Manipur, E. Ghats in the forests of Godavari and Vizagapatam up to 4,500 ft., W. Ghats from Poona southwards through the Nilgiris and Anamalais to Travancore, up to 6,000 ft., Burma, Tonkin, Cambodia, Malay Peninsula (cult.), Sumatra.

The bark and leaves possess bitter and tonic properties.

In Malaya, the fruits mixed with other drugs is used by thieves to stupefy people.

Almora: Banritha—; *Bengal:* Chenenji, Kapiakushi—; *Bombay:* Limbara—; *Canarese:* Kora, Limbara, Linabira—; *Haldwani:* Banritha—; *Lepcha:* Migliokkung—; *Malay:* Duak, Juak, Manchabei, Tangis sarang burong—; *Malayalam:* Korahadi, Kurukkati—; *Marathi:* Gundira—; *Nepal:* Ankhataruwa—; *Tamil:* Karai, Karaivilangu, Sendarai—.

CARAPA Aubl.

Glabrous littoral trees. Leaves impari- or abruptly- pinnate; leaflets opposite, entire. Flowers hermaphrodite, in lax axillary cymose panicles. Calyx 4-5-fid or partite. Petals 4-5, free, reflexed. Staminal tube urceolate-globose, 8-10-dentate, the teeth entire or bipartite; anthers 8-10, alternate with the teeth of the staminal tube. Disk fleshy, cup-shaped, adherent to the base of the ovary. Ovary 4-5-ribbed or sulcate, 4-5-celled; ovules 2-8 in each cell; style short; stigma discoid. Fruit capsular, subglobose, large, 6-12-seeded; pericarp fleshy, dehiscing by 4 valves. Seeds exarillate, large, thick, angular; testa hard, spongy; hilum large, ventral; cotyledons amygdaloidal.—Species 10.—Tropics.

1. Fruit about 15 cm. through or more .... 1. *C. moluccensis.*
2. Fruit 7.5-10 cm. diam. .... 2. *C. obovata.*

The bark is a bitter tonic, and a febrifuge. The oil is useful in the treatment of ulcers and skin diseases.

The following are used medicinally in Indo China—*C. moluccensis* Lam., *C. obovata* Blum.—; in the Malay Archipelago—*C. moluccensis* Lam.—; in Brazil and Venezuela—*C. guianensis* Aub.—; in the West Indies—*C. guianensis* Aub., *C. procera* DC.—; in West Africa—*C. procera* DC.—.

1. **Carapa moluccensis** Lam. Encycl. Meth. I, 621.—*Xylocarpus Granatum* Koen. in Naturf. Fr. XX (1784) 2.—PLATE 227.

Tree, usually about 12 m. tall, 30-60 cm. through, with flaking bark, much-branched. Leaves 10-25 cm. long; leaflets 2 pairs, coriaceous, dark green, ovate to ovate-oblong, subacute, base broad, 5-10 cm. long, 3.8-4.5 cm. wide. Panicles 7.5-12.5 cm. long, slender

with spreading branches. Petals white, rather broader than in obovata. Fruit large, globular, brown, about 15 cm. through or more.

Distribution: Littoral forests of Bengal, Burma, the Andamans, the Malay Peninsula and Archipelago, Australia, Fiji, Africa.

The bark, in common with other parts of the tree, possesses extreme bitterness, conjoined with astringency; it may probably prove a good astringent tonic. It is much employed by the Malays in cholera, colic, diarrhœa and other abdominal affections.

The pips yield by expression a bitter astringent oil which in the Philippines is given in diarrhœa and dysentery. The bark is prescribed in fevers. In Guiana too the bark is a reputed febrifuge.

The Orange-Dyakouns of the Malay Peninsula use the plant in the preparation of their poison " ipokrohi ".

Amboyna: Delima-laut, Martahul—; *Assam:* Xuong ca—; *Bengal:* Dhundul, Poshur, Pussur—; *Borneo:* Gniri—; *Burma:* Peng-lay-oang, Pinlayoung, Pinlon—; *Ceylon:* Kadulgaha, Kandalanga—; *Macassar:* Tambu—; *Malay:* Boa-taator, Boeliboeli, Cajubaca, Koopour, Kopah, Kopoh, Nirehbatu—; *Sinhalese:* Kadol, Mudunelun—; *Sunderbunds:* Pussur—; *Swahili:* Mkomafi—; *Tamil:* Kandalanga—.

2. **Carapa obovata** Bl. Bijdr. (1825) 179.—*C. moluccensis* Hiern in Hook. f. Fl. Brit. Ind. I, 567 (partim, non Lam.); Bedd. Fl. Sylv. t. 136.

A small tree. Leaves abruptly pinnate, 7.5-15 cm. long; leaflets coriaceous, 1-2 pairs, 7.5-10 by 3.8-4.5 cm., oblong-obovate or elliptic, obtuse or shortly acuminate, rarely subacute or notched, glabrous, base narrowed, subequilateral; petioles 4-8 mm. long. Flowers in axillary few-flowered cymose panicles 3.8-6.3 cm. long; pedicels 8-12 mm. long. Calyx-teeth broad, rounded. Petals 6 mm. long, broadly elliptic-oblong, rounded at the apex. Staminal tube shorter than the petals; anthers included. Ovary broadly ovoid; style conical; stigma large, discoid. Fruit the size of an orange, 7.5-10 cm. diam., apiculate when young, not so when ripe. Seeds angular; testa hard, spongy.

Distribution: Coast forests of the Indian Peninsula, Ceylon, Sundribuns, Chittagong, Burma, the Andamans and Malay Peninsula.—Malay Archipelago, Australia, Africa.

In the Mahanadi Delta, the fruit is largely collected. It is said to be a cure for swellings of the breast and elephantiasis.

Bengal: Dhundul—; *Burma:* Penglayoang, Pinle on—; *Chittagong:* Karambola—; *Indo China:* Dang dinh, Su—; *Malay:* Nirehbunga—; *Orissa:* Susambar—; *Sunderbunds:* Dhundol, Karambola—.

SOYMIDA A. Juss.

Species 1.—Indo-Malayan.

1. **Soymida febrifuga** A. Juss. Mém. Mus. Par. XIX (1830) 251, t. 22. fig. 26; Bedd. Fl. Sylv. t. 8.—*Swietenia febrifuga* Roxb. Hort. Beng. (1814) 33, Corom. Pl. I, 18, t. 17.—PLATE 228.

A tall tree. Leaves 23-45 cm. long, crowded towards the ends of the branches; leaflets 3-6 pairs, opposite, 5-11.3 by 2.5-6.3 cm., elliptic or oblong, obtuse, glabrous, penninerved, the nerves numerous and conspicuous beneath, base rounded, inequilateral, the lower side generally extending further down the petiolule than the upper; petiolules 3-6 mm. long. Flowers in large terminal or axillary divaricately branched panicles often equalling the leaves, the branches of the panicle alternate; pedicels very short; bracts minute, triangular, acute. Sepals 5, rotund, the margins membranous, slightly lacerate. Petals 5, obovate, 6 mm. long, clawed, often notched at the apex. Staminal tube about half as long as the petals, slightly urceolate; anthers attached by the middle of the back. Ovary glabrous; stigma large, discoid, 1.5 mm. diam., 5-lobed, the lobes radiating to the centre. Capsules 2.5-6.3 cm. long, obovoid, 5-celled, 5-valved. Seeds winged.

Distribution: Dry forests of the W. Peninsula, extending northwards to Merwara, the Mirzapur hills and Chota Nagpur, Ceylon.

The bark is acrid; refrigerant, anthelmintic, aphrodisiac, laxative; good for sore throat; removes "vata"; cures "tridosha" fevers, cough, asthma; removes blood impurities; good for ulcers, leprosy, dysentery (Ayurveda).

The bark is astringent to the bowels and useful in fevers (Yunani).

The bark is astringent, tonic and antiperiodic.

In intermittent fevers and general debility, in the advanced stages of dysentery, in diarrhœa, and in other cases requiring the use of astringents, it has been used with success.

The decoction forms a good substitute for oak-bark, and is well adapted for gargles, vaginal injections and enemas.

The bark of this tree is said to be a bitter tonic and a good antimalarial like cinchona. A decoction of the bark 1 in 20 was given in one ounce doses three times a day in cases of malarial fever and found to be beneficial. The action was not only very slow but very inferior to that of the alkaloids of cinchona (Koman).

Bengal: Rohan, Rohina, Rohra—; *Bhil:* Ryota—; *Bombay:* Rohan, Rohing—; *Canarese:* Kalkarige, Some, Sumbi, Svami—; *Central Provinces:* Bugutrori, Rohni, Rohun—; *Deccan:* Rohun, Rohunna, Rouen, Ruhin—; *English:* Bastard Cedar, Indian Red-wood, Rohan Tree—; *Gond:* Soimi—; *Gujarat:* Rohani, Rohina—; *Hindi:* Rakatrohan, Rohun, Rohunna—; *Kathiawar:* Rorna—; *Khond:* Somangi—; *Kolami:* Rakatrohen, Rohini—; *Lambadi:* Ronero—; *Mal Paharia:* Sohan, Suam—; *Marathi:* Potar, Ruhin—; *Merwara:* Rohan—; *Palkonda Hills:* Soymida—; *Porebunder:* Rona—; *Sanskrit:* Agniruha, Atiruha, Chandravallabha, Charmakasha, Kashamansi, Lomakarani, Mahamansi, Mansarohi, Mansarohini, Patranga, Praharavalli, Rasayani, Rohini, Suloma, Vasa, Vikasha, Viravati, Vritta—; *Santal:* Ruhen—; *Soara:* Somida—; *Tamil:* Sem, Somadanam, Sombu, Sumi, Surakkali, Vandu—; *Telugu:* Sevamanu, Somi, Somida, Somili, Sumi—; *Urdu:* Rohan—; *Uriya:* Karwi, Sohan, Sonhan, Suam—.

Chukrasia A. Juss.

Species 1.—Indo-Malayan.

1. **Chukrasia tabularis** A. Juss. in Mém. Mus. Par. XIX (1830) 251, t. 22, fig. 27; Wight Ill. t. 56; Bedd. Fl. Sylv. t. 9.—Plate 229.

Lofty trees. Leaves alternate, abruptly pinnate or bipinnate; leaflets alternate or subopposite, entire, unequal at base, acuminate, usually pubescent or even velvety. Flowers hermaphrodite, rather large, in terminal panicles. Calyx short, 4-5-lobed, with obtuse lobes. Petals 4-5, oblong, free, erect, contorted. Staminal tube cylindric, with 8-10 short crenate lobes at the apex; anthers erect, inserted within the crenatures and entirely exsert above them. Disk 0. Ovary shortly stipitate, cylindric-ovoid, 3-5-celled; style stout; stigma cylindric-capitate; ovules many in each cell, biseriate. Fruit a 3-5-celled, septifragally 3-5-valved capsule, the valves 2-lamellate separating from the 3-winged axis and often cleft at apex. Seeds many, flattened, broadly winged below; albumen 0; cotyledons orbicular.

Distribution: Sikkim, Chittagong, Burma, Andamans, Malay Peninsula, W. Peninsula along the W. Ghats from Bombay to Tinnevelly, Ceylon, Sandur Hills of the Deccan. —Cochin-China, China, Borneo.

The bark is powerfully astringent.

In Indo China the bark is a reputed astringent used as an anti-diarrhœic.

Andamans: Arrodah—; *Annam:* Truong van—; *Assam:* Boga poma—; *Bengal:* Chikrassi, Dalmara, Pabba—; *Bombay:* Pabha, Pubha—; *Burma:* Ngabai, Taw-yeng-ma, Taw-yimma, Yeng-ma, Yimma, Zimma—; *Canarese:* Dalmara, Davala, Gandhamalar, Gavude, Huruli, Kaladi—; *Ceylon:* Aglai, Kaloti—; *Chakma:* Chegarasi—; *Coorg:* Dalmara, Davala—; *English:* Bastard Cedar, Chittagong Wood, Indian Mahogany, Jamaica Cedar—; *Hyderabad:* Main—; *Kadir:* Malaveppu—; *Lambadi:* Kaladi—; *Lepcha:* Tumsungkung—; *Magahi:* Saiphra, Sey barasi—; *Malay:* Chenana putih, Suntang, Suntang putih—; *Malayalam:* Akil, Malaveppu, Suvannakil—; *Marathi:* Nul, Pabba, Palara—; *Nepal:* Hallongre, Hallongretun, Katli—; *Salem:* Ganti malle—; *Sinhalese:* Hulanghukgass, Hulanhickgala, Hulodi—; *Tamil:* Agil, Ayil, Kandamalai, Kulimatti, Madagirvembu, Malaivembu, Pallirukki, Selvangan, Tevaganni, Vedivembu—; *Telugu:* Ettapogada, Goddaliyappa, Kondavepa, Sittihangukatta—; *Tonquin:* Lat hoa—.

CEDRELA Linn.

Tall tree. Leaves pinnate; leaflets numerous, opposite or sub-opposite, entire or serrate. Panicles subterminal. Flowers 5-merous, white. Calyx short, 5-lobed. Petals oval. Stamens 5, free on a thick 5-lobed disk. Ovary sessile on the disk 5-celled, 8-12 ovules in each cell in 2 rows; style filiform. Stigma discoid. Capsule thinly woody, 5-celled, 5-valved. Seeds flat, winged at each end.—Species 16.—Tropics of both hemispheres.

Bark astringent and antiperiodic.

The following species are used medicinally in China—*C. sinensis* A. Juss.—; in Indo China and the Malay Archipelago—*C. toona* Roxb.—; in Central and South America—*C. fissilis* Vell., *C. glaziovii* C.D.C., *C. odorata* Linn.—.

1. **Cedrela toona** Roxb. ex Rottl. & Willd. in Ges. Naturf. Fr. Neue Schr. IV (1803) 198; Roxb. Corom. Pl. III, t. 238; Wight Ic. t. 161.—PLATE 230.

A tall tree reaching 18 m.; branches numerous, forming a shady head. Leaves abruptly pinnate, 30-45 cm. long or more; leaflets opposite or alternate, 4-15 pairs, 5-15 by 2-6.3 cm., lanceolate or ovate-lanceolate, acuminate, entire or slightly undulate, glabrous, base inequilateral, the upper side usually larger rounded, the lower smaller acute; petiolules 6-12 mm. long. Flowers white, honey-scented, in large drooping terminal more or less pubescent panicles nearly as long as the leaves; buds ovoid or oblong; pedicels short, slender. Calyx divided nearly to the base; lobes orbicular-ovate, ciliate. Petals 5 mm. long, broadly elliptic, obscurely veined, ciliate, keeled at the base inside. Stamens 5, each inserted on one of the orange-coloured hairy lobes of the disk; staminodes 0; filaments subulate; anthers oblong, cordate, rounded and apiculate at the apex. Ovary hairy, ovoid or subglobose; stigma 1.25 mm. diam. Capsules oblong, 2-2.5 cm. long. Seeds with a membranous wing at each end, about 2 cm. long including the wings.

Distribution: Sub-Himalayan tract from the Indus eastwards, Chittagong, Assam, Burma, Chota Nagpur, Ganjam, W. Ghats of Bombay to the Nilgiris and Anamalais and other hills of the W. Peninsula.

The bark has a sharp taste, acrid, sweet, bitter; digestible, astringent to the bowels, cooling, aphrodisiac, tonic, fattening; useful in ulcers, leprosy; removes "tridosha"; burning sensation; cures fevers, itching, headache, biliousness, and blood complaints (Ayurveda).

The bark is bitter; cardiotonic, aphrodisiac, expectorant, astringent to the bowels, anthelmintic; good for scabies and gleet. The seeds have the same properties (Yunani).

The flowers are considered emmenagogue in Bombay.

The bark is a powerful astringent, and has been used with success in chronic infantile dysentery and as a local astringent application in various forms of ulceration.

The resinous bark is prescribed in dysentery and in intermittent fevers in Indo China and the Malay Archipelago.

The finely powdered wood yields an essential oil which has been examined by P. Parameswaram Pillai (16th Ind. Sc. Congress, Madras, 1929).

Annam: Truong da, Xuong mat, Xuong moc, Xuong mot—; *Assam:* Henduripoma, Jia, Poma, Tun, Tungd—; *Badaga:* Kalkilingi—; *Bengal:* Lud, Tun, Tuni, Tunna—; *Bhuta:* Somso—; *Bicol:* Lanigda, Lanipga—; *Bombay:* Deodari, Kudaka, Kuruk, Limb, Mahanim, Tun, Tundu, Tuni, Tunna, Tupa—; *Burma:* Tawtama, Thitkadoe—; *Cagayan:* Danigga, Danupra—; *Cambodia:* So banne—; *Canarese:* Devadari, Gandhagarige, Garige, Kalingi, Kallukalingi, Kempugandhagarige, Kuruvaka, Mandurike, Suli, Tundu—; *Chakma:* Shuruzbed—; *Cochin China:* Xuong mat, Xuong moc, Xuong mot—; *Coorg:* Belandi, Noge—; *English:* Happy Tree, Indian Mahogany, Moulmein, Cedar, Sandal Neem, Singapore Cedar, Toon—; *Hindi:* Lim, Lud, Mahalimbu, Mahanim, Tun, Tuna, Tuni, Tunkajhar—; *Ilocano:* Cantingen, Porac—; *Kadir:* Vedivembu—; *Khond:* Grama—; *Kolami:* Katangai—; *Kumaon:* Tun—; *Laos:* So banne—; *Lepcha:* Simal—; *Magahi:* Chikado, Tsitkado—; *Malayalam:* Akil, Arana, Devabaram, Kacham, Kuberakam, Malarveppu, Sanakil, Tunnam, Vedivembu—; *Marathi:* Deodari, Kuruk—; *Mindoro:* Alam—; *Mundari:* Katanggadaru—; *Nepal:* Babich, Labshi, Tuni—;

Nilgiris: Kalkilingi—; *Pampangan:* Calantas—; *Philippines:* Lagini, Langpa—; *Punjab:* Bisru, Chitisirin, Darab, Der, Deri, Drab, Dravi, Guldar, Khanam, Khushing, Tun—; *Ranikhet:* Suni—; *Sadani:* Katanggari—; *Salem:* Mali, Suli—; *Sanskrit:* Apina, Apita, Kachha, Kachhaka, Kanta, Kantalaka, Kubheraka, Mahanim, Nanda, Nandaka, Nandi, Nandivriksha, Patuka, Pitaka, Tooni, Tunna, Tunnaka, Tunika—; *Satpuras:* Mahlun—; *Tagalog:* Calantas—; *Tamil:* Ayil, Madagirvembu, Mali, Sandanavembu, Sevvagil, Suli, Tevadaram, Tunu—; *Telugu:* Gali, Nandi—; *Tinnevelly:* Sandanivembu—; *Tipperah:* Kujya—; *Tongking:* Lat khet—; *Urdu:* Tun—; *Uriya:* Mohalimbo—; *Visayan:* Lanigda, Lanigpa, Lanipga—.

CHLOROXYLON Rumph.

Species 1.—E. Indies.

1. **Chloroxylon swietenia** DC. Prodr. I (1824) 625; Wight Ill. I, t. 56 bis.—*Swietenia chloroxylon* Roxb. Corom. Pl. I, t. 64.—PLATE 231.

A tree 9-12 m. high; bark corky, rough, deeply furrowed, yellowish. Leaves 15-23 cm. long, abruptly pinnate; leaflets subopposite or alternate, 10-20 pairs, 2-3.2 by 0.8-1.2 cm., oblong, obtuse, glabrous, glaucous, very inequilateral, the upper side of the leaflet larger than the lower and rounded, the lower side acute at the base; petiolules 1.5-3 mm. long. Flowers in branched many-flowered terminal and axillary panicles shorter than the leaves; buds globose; bracts minute, caducous. Calyx pubescent, deeply divided; lobes ovate. Petals 4.5 mm. long, ovate, acute, sagittate at the base, abruptly and shortly clawed, externally pubescent. Disk fleshy, pubescent. Stamens inserted between the lobes of the disk, shorter than the petals. Ovary immersed in the disk, 3-lobed, pubescent. Capsules oblong, acute, glabrous. Seeds 2-1.1 cm. long (including the membranous, somewhat falcate wing), 1.5 mm. broad.

Distribution: Dry deciduous forests in the Indian Peninsula, extending in the north to the Satpuras and Chota Nagpur, Ceylon.

The bark is used as an astringent.

The leaves are applied to wounds, and also prescribed in rheumatism.

The plant contains an alkaloid of unknown constitution, chloroxylonine,—a powerful irritant, causing dermatitis when applied to the skin.

Baigas: Bhirwa—; *Bombay:* Bheria, Billu, Hardi, Hulda—; *Canarese:* Bittulla, Huragalu, Hurihuli, Masula—; *Central Provinces:* Behra, Behru, Bhirra, Bihra, Bihri, Girya—; *Ceylon:* Mutirai—; *English:* Indian Satin-wood, Yellow Wood—; *Gond:* Bhira—; *Hindi:* Bhirra, Dhoura, Girya—; *Karwar:* Bharhul—; *Kolami:* Sengel sali—; *Kurnool:* Bilu—; *Marathi:* Bheria, Halda—; *Mysore:* Huragalu—; *Saora:* Bella—; *Sinhalese:* Buruta, Burutch gala, Burute, Ma-burute—; *Tamil:* Karumboraju, Kudavuboraju, Mudirai, Poraju, Van, Visaram—; *Telugu:* Billu, Billydu—; *Uriya:* Behru, Bhayru, Bheyri, Biluga—.

OLACACEAE.

Trees, shrubs or climbers. Leaves alternate, simple; stipules absent. Flowers actinomorphic, usually hermaphrodite and small. Calyx-lobes imbricate or open in bud. Petals free or variously connate, valvate. Disk various, often annular. Stamens free or rarely united into a column, the same number as and opposite to or fewer or more numerous than the petals, some often without anthers; anthers 2-celled, opening lengthwise or by pore-like slits. Ovary superior or slightly immersed in the disk, 1-3-celled, sometimes imperfectly so; style simple, with a 2-5-lobed stigma; ovules 1-5 from the apex of the central placenta of the 1-celled ovaries, or pendulous from the inner angle of the 2- or more- celled ovaries. Fruit often drupaceous, sometimes enclosed by the enlarged calyx. Seeds with copious endosperm and small or medium-sized straight embryo.—Genera 25. Species 120.—Tropics.

1. Leaves alternate. Fertile stamens 10 .... XIMENIA.
2. Leaves alternate. Fertile stamens 3-5 .... OLAX.

This Order is therapeutically inactive.

XIMENIA Linn.

A shrub or low tree. Branches spiny. Leaves shortly petioled, alternate, simple, 1-nerved. Flowers racemose, usually hermaphrodite. Calyx cupular, 4-5-toothed, persistent, not accrescent. Petals 4-5, oblong, revolute, hairy within. Stamens twice the number of the petals, hypogynous; anthers innate, linear, 2-celled. Staminodes 0. Ovary sessile, superior, 4-celled; style columnar, stigma simple; ovules solitary in each cell, pendulous, anatropous. Drupe ovoid, 1-celled; stone solitary.—Species 5.—Tropics.

X. americana Linn. is used medicinally in Nigeria, Rhodesia, *X. caffra* Sond. in Southern Africa.

1. **Ximenia americana** Linn. Sp. Pl. (1753) 1193.

A small much-branched spiny shrub; young parts glabrous; branches often ending in a spine. Leaves coriaceous, 2.5-5 by 1.3-3.8 cm., elliptic, obtuse at both ends, the apex sometimes emarginate; petioles scarcely 6 mm. long. Flowers white, fragrant, bisexual, or sometimes polygamous, 10 mm. long, in short racemes which are axillary or on the ends of lateral twigs; buds oblong, subacute; pedicels short; bracts minute, subulate. Calyx small, glabrous, deeply divided; lobes 5, ovate, acute, ultimately reflexed. Petals much longer than the calyx, 11 mm. long, equalling the stamens in length, linear-oblong, acute, shaggy inside. Ovary glabrous, ovoid-conical, longitudinally sulcate, rugose. Fruit ovoid or ellipsoid, 2-2.5 cm. long, deep orange when ripe; pericarp pulpy; endocarp 1-celled 1-seeded.

Distribution: E. & W. Peninsulas, Andamans, Ceylon.—Malaya, Tropical Africa, America.

The wood is used as a substitute for sandal.

In Nigeria, the seeds are used as a purgative.

In Rhodesia, the natives give a hot-water extract of the roots to calves as a remedy for sanguineous diarrhœa.

Afrikaans: Suurpruim, Wildeprium—; *Burma:* Penlayhsi, Pinlaikuyin, Pinlaytsi, Pinlezi—; *Canarese:* Kandarakkare, Nakkare—; *Ceylon:* Chimillantai—; *English:* False Sandal, Mountain Plum—; *Gold Coast:* Sennet, Tallow Nut, Wild Olive—; *Lambadi:* Nakkarero—; *Malay:* Bidara laut—; *Sokoto:* Tsada, Tswada—; *South Africa:* Citron of Sea, Mountain Plum, Seaside Plum, Sour Plum, Wild Lime, Wild Olive, Wild Plum—; *Sudan:* Alimu—; *Tamil:* Kadaranji, Siruyilandai—; *Telugu:* Kondanakkera, Nakkera, Nekkara, Uranakkera—; *Tigré:* Mellhetta—; *Tigrinia:* Mell'au, Mellukh, Melluoh—; *West Indies:* Seaside Plum—.

OLAX Linn.

Shrubs or undershrubs, sometimes scandent and spiny with alternate leaves. Flowers in axillary racemes or panicles with inconspicuous bracts. Perianth of a minute outer calyciform rim accrescent in fruit and 3-6 free or more or less connate sepals. Stamens 9-12, occasionally fewer, usually only 3 fertile; fertile stamens usually opposite to and attached to the edges and staminodes opposite the centres of the sepals. Anthers oblong, 2-celled and filaments free. Ovary superior, usually 3-celled below and 1-celled above, style simple, stigma 3-lobed. Ovules 3, pendulous from the axis, two soon abortive. Fruit drupaceous, surrounded by the accrescent outer perianth. Embryo minute apical in fleshy albumen. —Species 35.—Palaeotropics.

1. Climbing shrubs, armed. Drupe 10 mm. .... 1. *O. scandens.*
2. A low undershrub. Pedicel solitary .... 2. *O. nana.*

O. subscorpioides Oliv. is used medicinally in the Gold Coast.

1. **Olax scandens** Roxb. Corom. Pl. II (1798) 2, t. 102.—PLATE 232B.

A climbing, much-branched shrub, armed with slightly curved stout prickles on the old wood; branches terete, more or less pubescent. Leaves 5-9 by 2.5-3.8 cm., elliptic or oblong-elliptic, usually obtuse, glabrous above, glabrous or pubescent beneath, entire, base rounded or subacute; petioles 3-6 mm. long, pubescent. Flowers white,

fragrant, about 6 mm. long, in axillary racemes which are shorter than the leaves; buds oblong, somewhat clavate; pedicels short, pubescent; bracts ovate-oblong, as long as the pedicels, pubescent, ciliate, caducous. Calyx cup-shaped, truncate, ciliate. Petals linear, acute, more or less connate. Stamens about half as long as the petals. Ovary ovoid, glabrous; style about half as long as the petals; stigma 3-lobed. Drupes globose, 1 cm. diam., apiculate, covered except the top, by the accrescent calyx.

Distribution: W. Ghats of Bombay Presidency, Deccan, Carnatic and N. Circars of Madras Presidency, Ceylon, sub-Himalayan tract of Kumaon, Oudh, Bihar, Burma, Malay Peninsula.—Cochin-China, China, Java.

In Chota Nagpur, a preparation of the bark is given for poverty of blood during fevers (Campbell).

Bengal: Kokoaru—; *Burma:* Chaunglelu, Jounglailu, Lailu, Lelu—; *Canarese:* Bapanaballi, Karadu, Nakkare—; *Ceylon:* Kadalranchi—; *Hindi:* Dheniani—; *Jabalpur:* Kakundan—; *Khond:* Madalkura—; *Kolami:* Rimil, Rimilbiri, Rimmel—; *Marathi:* Harduli, Urchirri—; *Mundari:* Rimilara, Rimilbiri, Rimiljo—; *Santal:* Ehir, Hund—; *Tamil:* Malliveppam—; *Telugu:* Bapanamushti, Kogitatige, Murikimalle, Nallavudata, Taragavepa, Udupunakkeri, Udutanekkara—; *Uriya:* Badalia, Bader, Badurli, Bhadbhadia, Bodalia, Boderia, Bodobodoria, Bodohalia—.

2. **Olax nana** Wall. Cat. (1828) 6783—PLATE 232A.

A low undershrub; branches from a woody rootstock, twiggy. Leaves subsessile, 2.5-5.7 by 0.6-1.5 cm., oblong-lanceolate, obtuse, glabrous, base usually acute, midrib strong. Flowers 6-8 mm. long, white, solitary, axillary; pedicels slender, 6-12 mm. long. Calyx free, minute, cup-shaped, truncate or obscurely lobed. Petals 3, oblong-obovate, rounded at the apex, the tip inflexed, cohering about half way up but readily separable. Stamens 3, one in the centre of each petal, a little more than half the length of the petal and adnate to it about half way up; anthers yellow. Staminodes 6, one at each edge of each petal and a little shorter than it. Ovary ovoid; style shorter than the stamens. Fruit globose, 6 mm. long, apiculate, deep yellow when ripe, nearly covered by the accrescent calyx, 1-seeded.

Distribution: Kathiawar, N. Circars, Punjab, Kumaon, Nepal, Bihar, Bengal, Assam.

The fruit is used medicinally by the Santals (Campbell).

Gujarat: Himi, Shigroti, Sudi, Tadholi—; *Santali:* Merommet—.

ICACINACEAE.

Trees or shrubs. Leaves mostly alternate, simple; stipules absent. Flowers hermaphrodite or rarely unisexual by abortion, actinomorphic. Calyx small, inferior, 4-5-lobed. Lobes imbricate or rarely valvate. Petals 4-5, free or united, valvate, rarely absent. Stamens the same number as the petals and alternate with them; anthers 2-celled (sometimes deeply 4-lobed); filaments often hairy below the anthers, free. Disk rarely present. Ovary 1-celled, rarely 3-5-celled; ovules pendulous from near the top of the ovary, usually 2; style usually short. Fruit drupaceous, 1-celled, 1-seeded, rarely winged. Seeds mostly with endosperm; embryo usually small, more or less straight.—Genera 38. Species 200.—Tropics.

The Order is therapeutically inert.

Sarcostigma Wight & Arn.

Scandent shrubs. Leaves alternate. Flowers dioecious, minute, in distant sessile fascicles arranged on elongate interrupted spikes. Calyx cupshaped, unequally 4-5-toothed. Petals 4-5, united into a short tube which is adnate to a stipitiform torus, free above, valvate, slender, flat. Male flowers: Stamens hypogynous, alternate with the petals and scarcely cohering with them at the base; filaments filiform; anthers versatile. Female flowers: Ovary sessile, 1-celled, superior; ovules 2, pendulous from the apex of the cell, funicle thick; stigma subsessile. Drupe oblong; epicarp coriaceous; putamen woody. Seeds pendulous; albumen 0; cotyledons fleshy, cordate at

the base, wrapping round the short superior radicle.—Species 3.—Indo-Malayan.

The genus is therapeutically inert.

1. **Sarcostigma kleinii** Wight & Arn. in Edinb. New Phil. Journ. (1832-33) 299; Wight Ic. t. 1854.—PLATE 233.

A large climbing shrub; young branches terete, glabrous. Leaves coriaceous, 10-30 by 5-10 cm., oblong, oblong-lanceolate or ovate, acuminate or acute, glabrous, shining, closely reticulately veined (the reticulations prominent on both surfaces), base acute, rarely rounded; petioles 6-20 mm. long. Inflorescence axillary or extra-axillary, in spicate racemes which are solitary or fascicled and longer than the leaves; flowers minute, in fascicles of 1-4, subsessile along a woody rhachis. Male flowers: Calyx small cup-shaped, pubescent outside, 5-toothed, teeth short, triangular. Petals 2.5 mm. long, oblong, acute, reflexed. Stamens a little shorter than the petals. Ovary rudimentary, small, conical. Female flowers slightly larger than the male. Calyx and petals as in the male. Stamens small, about half as long as the ovary, hypogynous. Ovary large, oblong or somewhat obovoid, pubescent; stigma large, subsessile, conical. Fruit 2.5-3.8 cm. long, the shape of an olive, bright orange-red, externally rugose.

Distribution: W. Ghats from N. Kanara southwards to the Wynaad, Anamalais and Travancore Hills at low elevations.

The oil is highly esteemed in the treatment of rheumatism (Drury).

Tamil: Puvanna, Puvennai—.

CELASTRACEAE.

Erect trees, shrubs or climbers. Leaves alternate or opposite, simple; stipules small and caducous or absent. Flowers mostly cymose or fasciculate, often hermaphrodite, actinomorphic, small.

Calyx 4-5-lobed, imbricate, very rarely valvate. Petals 5, rarely 0, imbricate or rarely valvate. Stamens 4-5, rarely more, alternate with the petals, inserted on or below the margin of the disk; anthers 2-celled, opening lengthwise. Disk usually present, often fleshy and flat. Ovary superior, free or adherent to the disk, 1-5-celled; style short, more or less 3-lobed; ovules mostly 2, from the inner angle of the cells. Fruit various. Seeds mostly with copious fleshy endosperm and rather large straight embryo; cotyledons flat, foliaceous.—Genera 38. Species 480.—Tropical and temperate regions.

A. Stamens 4 or 5, rarely more, inserted on or beneath the margin of the conspicuous disk. Filaments subulate, often incurved

- I. Leaves opposite. Fruit a capsule, dehiscent
  - a. Ovules 1-2 in the axis of each cell
    Petals free, efoveolate. Ovules 2 in each cell .... EUONYMUS.
  - b. Ovules 4 or more in each cell
    Ovary 3-celled. Seeds exarillate, winged, exalbuminous .... KOKOONA.
- II. Leaves alternate. Ovules 2 in each cell, erect. Fruit dehiscent
  - a. Ovary free. Seeds arillate. Shrubs usually scandent. Flowers paniculate or racemose .... CELASTRUS.
  - b. Ovary confluent with the disk. Erect shrubs or trees, often spinose. Flowers cymose .... GYMNOSPORIA.
- III. Leaves opposite or subopposite. Fruit a dry or pulpy drupe
  Ovary confluent with the disk. Flowers cymose. Seeds exarillate .... ELAEODENDRON.

B. Stamens 3, rarely 2, 4 or 5, inserted on the face of the disk. Filaments flattened. Fruit a berry.
Seeds not winged. Erect shrubs. Leaves opposite .... SALACIA.

As a rule they are bitter and astringent, emetic and cathartic.

The following substances have been isolated from them: (1) alcohols—dulcitol, euonymol, methyl alcohol—; (2) phystosterol-like compounds—atropurpurol, citrullol, euonysterol, homoeunysterol—; (3) acids—cerotic, citric, euonic, furan-β-carboxylic, linoleic, malic, oleic, palmitic—; (4) carbohydrates—dextrose—; (5) toxic resins—euonymin—; (6) alkaloids—cathidine, cathine, cathinine—.

OFFICIAL:—*Euonymus atropurpureus* Jacq. (France).

EUONYMUS Linn.

Trees or shrubs, usually glabrous. Leaves opposite; stipules caducous. Flowers axillary, small. Calyx 4-5-fid, persistent. Petals 4-5, inserted on the disk; filaments usually very short; anthers broad, 2-celled. Disk large, fleshy, 4-5-lobed. Ovary sunk in the disk, 3-5-celled; ovules 2 in each cell; style short or 0; stigma 3-5-lobed. Capsule 3-5-celled, 3-5-lobed, angled or winged, sometimes echinate, loculicidally 3-5-valved, cells 1-2-seeded. Seeds enclosed in a fleshy aril, albuminous; cotyledons broad, foliaceous. —Species 100.—N. temperate and S.-E. Asia.

1. Flowers in 7- or more- flowered dichotomous cymes. Branches cylindric .... 1. *E. tingens.*
2. Peduncles 1-3-flowered. Flowers usually 5-merous. Petals fimbriate .... 2. *E. javanicus.*

The therapeutically active species are chiefly used for their tonic, diuretic, and laxative properties.

The following are used medicinally in Europe—*E. europaeus* Linn., *E. verrucosus* Scop.—; in Indo China—*E. Javanicus* Bl., *E. Japonicus* Linn. f., *E. thunbergianus* Bl.—; in China—*E. Japonicus* Miq., *E. thunbergianus* Bl.—; in North America—*E. atropurpureus* Jacq.—.

OFFICIAL:—The root-bark of *E. atropurpureus* Jacq. (France).

1. **Euonymus tingens** Wall. in Roxb. Fl. Ind. ed. Carey II, 406; Collett Fl. Siml. fig. 28.—PLATE 234B.

A small evergreen tree with rather dense rounded crown up to 2.4 m. girth and 7.5 m. high. Twigs rough with minute tubercles, glabrous. Bark grey or pale ashy, roughish, corky. Blaze 0.9-2.3 cm., shortly fibrous, pink or white with pink bands, often tinged with chlorophyl on the outside, dead tissue orange-yellow. Leaves 3.3-7.5 by 1.8-3.3 cm., elliptic or ovate-lanceolate, acute or acuminate, serrate or crenate, glabrous, thick, somewhat glossy dark green above with very depressed secondary and tertiary nerves. Petiole 5-7.5 mm. long. Flowers 5-merous or sometimes 4-merous, 1.2-1.9 cm. diam., faintly scented, in axillary dichotomous cymes which are often clustered at the bases or tips of the shoots without subtending leaves.

Peduncles 1.2-3.8 cm. long, flattened. Pedicels 7.5-12 mm. long. Petals pale yellowish white veined with purplish red, orbicular. Capsule 1.2 cm. long, turbinate, lobed or obscurely angled. Seeds dark brown, shining, half enclosed in a red aril.

Distribution: Himalaya from the Sutlej to Nepal, 6,500—10,000 ft.

The bark is considered useful in diseases of the eye (Royle).

Bussahir: Skiosh—; *Garhwal:* Konkon—; *Jaunsar:* Bhambeli, Roini—; *Kumaon:* Konkon—; *Marathi:* Kunku—; *Nepal:* Kasuri, Newar—; *North-Western Provinces:* Kungkur—; *Simla:* Chopra, Nermahaul—.

2. **Euonymus javanicus** Bl. Bijdr. 1146.

Glabrous shrubs, from 1.8-6 m. tall. Leaves thinly coriaceous, oblong-lanceolate to elliptic-oblong, base connate; nerves 5-6 pairs, 10-15 cm. long, 3.4-6.3 cm. wide; petioles 7.5-13 mm. long. Flowers in fascicles of 2 or 3, or in 2- or 3- flowered cymes. Peduncles 1.3 cm. long, 1.3 cm. across. Sepals 5, round. Petals oblong, fimbriate, greenish white. Stamens 5; ovary conic. Fruit pyriform deep 5-lobed, beaked, 2 cm. long, red.

Distribution: Malay Peninsula, Burma.—Malay Islands.

In Cochin-China and Cambodia every part of the plant is considered aperient.

Indo China: Do chong—.

KOKOONA Thwaites.

Branching trees with yellow or pale coloured bark. Leaves opposite, petioled, coriaceous. Calyx small, 5-lobed. Petals 5, coriaceous, with glandular dots. Stamens 5, inserted into the margin of the disk; anthers oblong. Disk thick, glandular, obscurely angled. Ovary immersed in the disk, 3-celled; style short, stigma 3-lobed; ovules 4 in each cell, in 2 series, adnate to the axis, ascending. Capsule woody, oblong, 3-gonous, 3-celled, 3-valved; cells 4-seeded. Seeds broadly winged above, imbricate, exalbuminous.—Species 3. —Indo-Malayan.

Therapeutically the genus has no importance.

1. **Kokoona zeylanica** Thw. in Hook. Kew Journ. Bot. V, 380, t. 6.—PLATE 234A.

A large tree, much-branched. Leaves on young plants 15-20 cm. long, oblong-lanceolate, subacuminate, serrate, on adult trees 6-9 cm., elliptic or obovate, crenate, rounded at the apex or emarginate, dark green above and glabrous, paler beneath and with numerous dark red glandular dots. Calyx small, 5-lobed. Petals 5, broadly ovate, coriaceous, naked, brown, with numerous minute dark red glandular dots. Stamens 5. Disk fleshy, dark green. Capsule 2.5-10 cm. oblong, bluntly trigonous; valves 3, thick, coriaceous, glabrous; cells 4-seeded. Seeds winged.

Distribution: Anamalais, forests of the moist region of Ceylon.

The inner yellow bark is employed medicinally. It is also made into a kind of snuff, which excites copious secretion, and is considered beneficial in headache.

Pilgrims to Adam's Peak in Ceylon use the oil for protection against leeches.

Sinhalese: Kokun, Pothaeta, Pottueta, Wanapotu—.

CELASTRUS Linn.

Climbing unarmed shrubs. Leaves alternate, entire or crenulate; stipules 0 or minute. Flowers polygamous. Calyx 5-lobed. Petals 5, spreading. Disk broad, 5-lobed. Stamens 5, inserted on the margin of the disk. Ovary in female flowers 3-celled; stigmas 3, recurved; ovules 2 in each cell. Fruit a 1-3-celled, loculicidal capsule, 1-6-seeded. Seeds enclosed in a fleshy aril.—Species 50. —Tropics and subtropics.

The genus has powerful stimulant and diaphoretic properties.

The following are used medicinally in Indo China—*C. paniculatus* Willd.—; in Abyssinia—*C. serratus* Hochst.—; in North America—*C. scandens* Linn.—.

1. **Celastrus paniculata** Willd. Sp. Pl. I (1797) 1125; Wight Ill. t. 72; Ic. t. 158.—PLATE 235.

A large deciduous climber with stems up to 23 cm. diam. and 18 m. high, sometimes twining dextrorsely but more often rambling.

Twigs fairly smooth, reddish brown, densely covered with small elongate whitish lenticels. Bark pale brown, rough with shallow cracks, exfoliating in small soft scales. Blaze 7.5-10 mm., not fibrous, pink finely streaked with red or reddish brown, the juice turning blue on the blade of a knife. Leaves 6.3-10 by 3.8-7.5 cm., broadly elliptic ovate or obovate, abruptly short-acuminate, crenate-serrate, rather coriaceous, glabrous, lateral nerves arching. Petiole 7.5-15 mm. long. Flowers 3.8 mm. diam., green, in terminal drooping panicles 5-20 cm. long. Capsules 1-1.3 cm. diam., depressed-globose, 3-lobed, bright yellow, 3-6-seeded. Seeds completely enclosed in an orange-red aril.

Distribution: Sub-Himalayan tract from the Jhelum eastward, up to 6,000 ft., throughout the hilly parts of Bombay, south of Gujarat, of Central India and the Madras Presidency, Ceylon, Burma, Malay Peninsula and Archipelago.

The leaves are emmenagogue.—The seeds are hot, bitter, acrid, dry; appetiser, laxative, emetic, aphrodisiac; powerful brain tonic; remove "vata" and "kapha"; cause burning sensation.—The oil enriches the blood and cures abdominal complaints (Ayurveda).

The seeds have a bitter sharp taste; expectorant, tonic, to the brain and the liver; cure joint pain, paralysis, and weakness.—In addition to the properties of the seeds the oil is stomachic, tonic; good for cough and asthma; used in leprosy; cures headache and leucoderma (Yunani).

The seeds are thought to be hot and dry, aphrodisiac and stimulant, useful both as an external and internal remedy in rheumatism, gout, paralysis, leprosy, and other disorders which are supposed to be caused by cold humours. Crushed and combined with aromatics, they are said to be very efficient in removing local pains of a rheumatic or malarious nature. Bruised and formed into a poultice, they are a good stimulant application to foul, unhealthy and indolent ulcers. In Ajmere, they are considered sudorific.

The seeds are supposed to have the property of stimulating the intellect and sharpening the memory.

In the Konkan, 4 tolas of the leaf-juice are given as an antidote in overdoses of opium; the seeds, made into a paste, with cow's urine, are applied to cure scabies.

A black empyreumatic oil is obtained by distillation. This was considered a sovereign remedy in Beri-beri. In doses of from ten to fifteen drops, twice daily, it is a powerful stimulant. Its action in this character is generally followed in a few hours by free diaphoresis, unattended by subsequent exhaustion.

The oil is used in the courts and colleges by a great many *pandits* and *munshis* to increase the intelligence of their pupils.

The Santals prescribe the oil in disorders of the stomach.

In Ceylon, the bark is considered to strengthen the brain and purify the blood; the oil from the seeds is used to cure sores.

The oil from the seeds has been examined by Solanki, Nargund, and Kanga and a few analytical data have been established (16th Ind. Sc. Congress, Madras, 1929).

Almora: Papkakani—; *Bengal:* Lataphataki, Malkangni—; *Bhil:* Malkangni—; *Bombay:* Kanguni, Malkangni—; *Burma:* Myinkoungnayoung—; *Canarese:* Gavanagonge, Kangli, Kangondi, Karegavane, Kariganne—; *Central Provinces:* Kakundanrangul, Vahrangur—; *Chindwin:* Wina—; *Deccan:* Malkanguni—; *English:* Black Oil Tree, Climbing Staff Plant, Intellect Tree—; *Garhwal:* Malkauni—; *Gujarat:* Malkangana, Malkankanino, Velo—; *Hindi:* Malkakni, Malkamni, Malkangni, Malkungi—; *Indo China:* Day sang mau—; *Kharwar:* Konjri—; *Kolami:* Kujuri—; *Kumaon:* Makangni, Malakoni, Malkakni, Malkauni, Papkakani—; *Laos:* May thee—; *Lepcha:* Ruglim—; *Malayalam:* Palulavam—; *Mal Paharia:* Chiron—; *Marathi:* Kangani, Malkangani, Malkangoni, Pigavi—; *Mundari:* Kujuri—; *Naguri:* Kujuru—; *Oudh:* Kakundan, Malkakni—; *Porebunder:* Malakakani, Malakankana—; *Punjab:* Sankhu—; *Sadani:* Kujur—; *Sanskrit:* Agnimasha, Amruta, Avega, Dipta, Durjara, Durmada, Gatida, Ingudi, Jyotishka, Jyotishmati, Jyotislata, Kakandi, Kanguni, Katabhi, Kinshuka, Lagana, Lavana, Medhya, Nishphala, Paravatanghri, Paravatapadi, Pidya, Pinya, Pitataila, Putitala, Saraswati, Sphutabandhani, Supingala, Swarnalata, Tahnirusi, Triparni—; *Santal:* Kujari, Kujri—; *Saora:* Erileta, Odur—; *Sinhalese:* Duhudu—; *Tagalog:* Bilogo—; *Tamil:* Adibaricham, Kalambam, Kagodagi, Kaligam, Kirumikkundram,

Kungiligam, Kuvangundal, Malganguni, Mallagam, Siruvaluluvai, Sodiyam, Tanisi, Tipadisam, Valuluvai—; *Telugu:* Bavanji, Erukata, Gundumeda, Malkanguni, Maneru, Mayalerukata, Pallerutiva—; *Tharu:* Maltangun—; *Urdu:* Malkanguni—; *Uriya:* Katopesu, Khorosano, Korsana, Noibado, Odnagudinoi, Peng—.

Gymnosporia Benth. & Hook. f.

Shrubs or small trees often spinous. Leaves alternate, exstipulate. Flowers small, greenish or yellow, in axillary solitary or fascicled cymes. Calyx 4-5-fid or 4-5-partite. Petals 4-5, spreading. Stamens 4-5, inserted on the margin of, or beneath the disk; anthers broadly didymous. Disk broad, lobed or sinuate. Ovary usually with a broad base, confluent with the disk, trigonal or pyramidal, 2-3-celled; ovules 2 in each cell; style short; stigmas 3. Capsule obovoid or rarely globose, 3-gonous, 2-3-celled, 1-4-seeded. Seeds with a perfect or imperfect aril or exarillate; testa coriaceous; albumen fleshy; cotyledons foliaceous.—Species 80. —Tropics and subtropics, especially Africa.

1. Leaves 2.5-7.5 by 0.6-5 cm. .... 1. *G..spinosa.*
2. Leaves 2-4.5 by 0.8-2.5 cm. .... 2. *G. royleana.*

The genus has no therapeutical value.

G. brachystachya Baker is used medicinally in Madagascar, *G. buxifolia* Szysz. in South Africa.

1. **Gymnosporia spinosa** (Forsk.) Fiori Bos. e Piante legn. Eritrea (1909) 225.—*Catha spinosa* Forsk. Fl. Aeg.-Arab. (1775) 64.—*Gymnosporia montana* (Roth.) Benth. Fl. Austral. I (1863) 400.—*Celastrus senegalensis* Lam. Encyc. I, 661; Bedd. Fl. Sylv. LXVI, t. 10, f. 2.—Plate 236 (under *G. montana* Benth.).

A tall shrub or sometimes a small tree; young branches often spinescent at the extremities and bearing leaves and flowers. Leaves turning very pale in drying, coriaceous, about 3-5 by 2-3.8 cm., variable in size and shape, elliptic or obovate, usually rounded at the apex, entire or crenulate, tapering at the base into the petiole; petioles 3-10 mm. long. Flowers in axillary usually furcately branched cymes; peduncles slender, solitary or fascicled; pedicels

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filiform, jointed below the middle; bracts small, lanceolate, acute. Calyx-lobes broadly elliptic-oblong, rounded at the apex, ciliate. Petals 3 mm. long, elliptic-oblong. Filaments flattened and dilated at the base. Disk fleshy, 10-lobed. Ovary glabrous, orbicular; style in the fertile flowers deeply 2-3-cleft. Capsules about as large as a good-sized peppercorn or small pea, purple when ripe. Seeds glabrous, chestnut-brown, rugose, arillate.

Distribution: Punjab, Sind, W. Rajputana, Gujarat, Khandesh, W. Peninsula, Deccan, C. Provinces, Bihar.—Afghanistan, Arabia, Mediterranean, tropical Africa, Malaya, Australia.

The fruit is sour, sweet, acrid; digestible, stomachic, refrigerant, purifies the blood; cures biliousness, ulcers, piles; removes "kapha", inflammation, burning, thirst, corneal opacities (Ayurveda).

The root, stem, bark, and leaves, all enter into the composition of Sushruta's Ksharagada, a cure for snake-bite.

The bark ground to a paste is applied with mustard oil to destroy lice of the head.

No part of the plant is an antidote to snake-venom (Mhaskar and Caius).

Ajmere: Kakra—; *Baluchistan:* Vingar—; *Bengal:* Vaichigachha—; *Bhil:* Dhatti—; *Bombay:* Hurmacha, Malkangoni, Zekadi—; *Canarese:* Halumanike, Malegu, Malkanguni, Tandraja, *Central Provinces:* Baikal, Gajachinni—; *Gond:* Babur, Danta—; *Gujerati:* Vikalo, Vikaro—; *Hindi:* Baikal, Kingani, Tondarsaijhad—; *Kohlu:* Zarlagh—; *Lambadi:* Kankala—; *Las Bela:* Kator—; *Marathi:* Bharatti, Bharuli, Vekal, Vekar, Yekkadi—; *Ormara:* Kator—; *Porebunder:* Vikaro—; *Punjab:* Dajkar, Kharai, Kingaro, Mareila, Talkar—; *Sanskrit:* Bahuphala, Bramhapadapa, Dantakashtha, Gopaghanta, Granthila, Himaka, Kantakari, Kantaki, Kantapada, Kantapatra, Kinkari, Madhuparni, Mriduphala, Padarohina, Pindara, Prithubija, Putakinkani, Ravana, Sragdaru, Sruvadruma, Sruvavriksha, Sudhavriksha, Svadukanta, Vaikankata, Vikankata, Vritinkar, Vyaghrapada, Yadnavriksha, Yadniya—; *Tagalog:* Malarayap—; *Tamil:* Kattanji, Valuluvai—; *Telugu:* Dantausi, Danti, Gajasinni, Gechangi, Peddachintu, Peddadanta, Sinni—; *Tigré:* Erghitte,

Urgudi—; *Tigrinia:* Argudi, Argutti, Urgudi—; *Trans-Indus:* Sherawane—; *Uriya:* Gourokosa—.

2. **Gymnosporia royleana** M. Laws in Hook. f. Fl. Brit. Ind. I, 620.—*Celastrus spinosus* Royle Ill. 157.

An erect evergreen shrub, 1.2-3.6 m. high with stems up to 20 cm. diam. Twigs glabrous or nearly so. Bark pale brown, roughish, corky. Blaze 6-9 mm., cheesy, pink sometimes with purplish markings. Branches stiff usually armed with straight, sharp, axillary, simple thorns up to 3 cm. long. Leaves 1.3-6.3 by 1-3 cm., ovate-elliptic or obovate, thick, coriaceous, glabrous, serrulate, dull dark green, with 4-8 pairs of very indistinct lateral nerves. Petiole 2.5-6 mm. long, glabrous, often tinged pink. Flowers 5-6 mm. diam., white or greenish yellow, in fascicled axillary few-flowered cymes up to 1 cm. long; rarely produced on the axillary thorns. Pedicels 2.5-5 mm. long, slender, often tinged pink. Capsule 7.5-12.5 mm. long, turbinate, 3-celled, slightly lobed, smooth, brown. Seeds 3-6, almost completely surrounded by a white aril.

Distribution: W. Himalaya, Kumaon and Garhwal up to 4,500 ft.—Afghanistan.

In the Salt Range the smoke from the seeds is said to be good for toothache.

Hindi: Gwaladarim, Jaliddhar—; *North-Western Provinces:* Bagriwaladarim, Gwaladarim, Kura—; *Punjab:* Badlo, Kadewar, Kamla, Kander, Kandiari, Kandu, Lap, Lei, Li, Pataki, Phupari—; *Ranikhet:* Gwaldari, Kanai—; *Telugu:* Danti, Goddatisinni—; *Trans-Indus:* Dzaral—; *Uriya:* Koirogo—.

ELAEODENDRON Jacq. f.

Trees or shrubs. Leaves opposite or subopposite, entire or crenate; stipules minute, caducous.. Flowers hermaphrodite, sometimes polygamous, in axillary dichasioid corymbose cymes. Calyx 5-lobed; lobes often unequal, imbricate.. Petals 5, spreading. Disk thick, cushion-like, margin sinuate. Stamens 5, inserted into the margin of the disk; filaments slender, at length recurved; anthers subglobose. Ovary adnate to the disk, conical, 2-5-celled; style

short; stigma small; ovules 2 in each cell. Fruit an indehiscent drupe, dry or succulent; stones 1-3-celled, cells 1- rarely 2- seeded. Seeds erect, exarillate; testa membranous or spongy; albumen 0; cotyledons thick, fleshy; radicle inferior.—Species 30.—Tropics and subtropics.

The genus has powerful astringent properties.

E. glaucum Pers. is used medicinally in Indo China; *E. orientale* Jacq. in La Reunion; *E. gymnosporoides* Baker, *E. oliganthum* Baker, *E. vaccinioides* Baker in Madagascar; *E. velutinum* Harv. in South Africa.

1. **Elaeodendron glaucum** Pers. Syn. I (1805) 241.—*E. Roxburghii* Wight & Arn. Prodr. I, 157; Wight Ill. t. 71; Bedd. Fl. Sylv. t. 148.—Plate 237.

A small tree. Leaves 6.3-15 by 2.5-6.3 cm., extremely variable, elliptic, acute or acuminate, often twisted at the apex, crenate-serrate or subentire, glabrous, base acute or rounded; petioles 1.2-2 cm. long. Flowers numerous, in divaricate axillary or extra-axillary paniculate dichotomously branched cymes; pedicels slender, glabrous; bracts small, ovate, acute. Calyx very deeply divided; lobes unequal, orbicular, with membranous margins. Petals 4 mm. long, oblong, obtuse, distant. Stamens much shorter than the petals; anthers roundish. Disk thick and fleshy. Drupes obovoid, 8-12 mm. long, apiculate.

Distribution: Sub-Himalayan tract and outer valleys, up to 6,000 ft., Ravi to Sikkim, Bundelkhand, Bihar, Central Provinces, Konkan, W. Ghats, W. coast of Madras Presidency, Deccan, Carnatic, N. Circars, Ceylon.—Siam.

The powdered leaves have a powerful sternutatory action, and are used as a fumigatory to rouse women from hysterical syncope, and as a snuff to relieve ordinary headache.

The fresh root-bark, when rubbed into a paste with water, is applied to remove almost every sort of swelling. The root is a specific against snake-bite, and the bark is used in native medicine and said to be a virulent poison.

Among the Mundas a piece of the root, as thick as the finger and a little longer, is crushed and soaked in water. The solution,

strained off, is taken as an emetic. Overdoses are fatal. The solution is also rubbed on the chest in pneumonia.

The root is useless in the antidotal treatment of snake-bite (Mhaskar and Caius).

Almora: Loonia, Sauni—; *Banda:* Jamrasi, Mamri—; *Bengal:* Rajjehul—; *Bhil:* Batakaras—; *Bombay:* Aran, Bhukas, Tamruj—; *Bundelkhand:* Mamri—; *Canarese:* Kannire, Mukarive, Mukarki, Mukkarite—; *Central Provinces:* Jamrasi, Jum, Kalamukha, Rassi, Rohi—; *Ceylon:* Perunpigari, Piyari—; *Dun:* Dhebri, Jangel, Jangela, Paniala—; *English:* Ceylon Tea—; *French:* Olivetier—; *Garhwal:* Dhebri—; *Ghatwal:* Ratangurur—; *Gond:* Dhakka, Nisur—; *Gujarat:* Alan—; *Hindi:* Jamrassi—; *Hushiarpur:* Mugoo—; *Hyderabad:* Bhutrakshi—; *Indo China:* Bi bai—; *Kolami:* Miri, Thanki—; *Konkan:* Burkas—; *Kumaon:* Shauriya—; *Kurku:* Niru—; *Lambadi:* Mukkarite—; *Lepcha:* Chikyeng—; *Malayalam:* Karuniraka—; *Marathi:* Aran, Bhutapala, Bilur, Burkas, Butapala, Tamruj—; *Melghat:* Niru—; *Mundari:* Niri, Nirsin—; *Naguri:* Harsing—; *North-West Provinces:* Bakra, Chauli, Dabero, Jamuwa, Mamri—; *Oudh:* Chauri, Metkur—; *Punjab:* Bakra, Jamoa, Mirandu, Morindu, Padriun—; *Ramnagar:* Sounria—; *Ranikhet:* Ajan—; *Santal:* Neuri, Niuri—; *Sinhalese:* Bhutapala, Chutaya, Nerrelu, Pieri, Tamaruje—; *Tamil:* Irgoli, Kannirai, Karrukuva, Karuvali, Kiri, Pirai, Seluppai, Siri—; *Telugu:* Bira, Bhutankusamu, Kannilu, Kanniru, Nerasi, Niradi, Nirija—; *Tharu:* Mutowar—; *Uriya:* Mokha, Pisitondoro—.

SALACIA Linn.

Scandent or sarmentose shrubs or small trees. Leaves usually opposite, petioled, coriaceous, shining above, exstipulate. Flowers small, axillary or extra-axillary, fascicled or cymose, rarely solitary or 2-nate. Calyx small, 5-partite. Petals 5, spreading, imbricate. Stamens 3 (very rarely 2 or 4), inserted on the disk, free or connate with the ovary; filaments conniving at the apex, recurved; anthers small, dehiscing extrorsely (on account of the recurved filaments), adnate, 2-celled, lobes divaricating at the base. Disk thick, sinuate. Ovary sunk in the disk, conical, 3-celled; ovules 2, 4 or more in each

cell, affixed to the axis, 1- or 2- seriate; style usually very short; stigma simple or 3-lobed. Fruit baccate, edible, 1-3-celled; cells 1-4-seeded; rind coriaceous or subwoody; pulp mucilaginous. Seeds large, angular; testa rather thick, coriaceous or fibrous; cotyledons thick, usually conferruminate.—Species 100.—Tropics.

1. Leaves subcoriaceous 7.5-15 cm. .... 1. *S. oblonga.*
2. Leaves coriaceous 6.3-10 cm. .... 2. *S. reticulata.*

S. togoica Loes. is used medicinally in the Gold Coast.

1. **Salacia oblonga** Wall. Cat. (1828) 4226; Wight Ill. t. 47, B; Ic. t. 97.

A scandent shrub; young parts glabrous; branches lenticellate. Leaves numerous, 7.5-15 by 3.2-5 cm., elliptic-oblong, rounded or sometimes obtusely acuminate at the apex, crenate-serrate, glabrous, tapering into the petiole, prominently reticulately veined beneath; petioles 6 mm. long, rugose. Flowers greenish-yellow, axillary, usually 3 together, with or without a short common peduncle. Calyx persistent, glabrous outside, deeply divided; lobes orbicular, finely ciliate, about half as long as the petals. Petals 3 mm. long, oblong rounded at the apex, spreading. Stamens inserted on the disk close up to the ovary; filaments erect, dilated at the base, the triangular dilated base embracing the ovary; anthers suborbicular-oblong, 2-celled. Ovary about half immersed in the disk, conical, attenuated into the style which is slightly shorter than the stamens. Fruit reaching 5 cm. diam., globose or somewhat pyriform, orange when ripe. Seeds 1-8, angular, large, immersed in pulp.

Distribution: W. Peninsula, Ceylon.

The root bark is used in rheumatism, gonorrhoea, and skin diseases.

Ceylon: Chundan—.

2. **Salacia reticulata** Wight Ill. I (1838) 134.

A large woody climber, much dichotomously branched, bark pale yellow, young parts glabrous. Leaves 6.3-11 cm., oval, narrowed at base, usually shortly acuminate, obtuse, very shallowly crenate-serrate, glabrous and shining, paler and with prominent reticulate veins beneath, subcoriaceous, petiole 6 mm. Flowers 6 mm., on short

glabrous pedicels, 2-10 together on woody axillary tubercles. Calyx scarcely lobed, glabrous; petals oblong, obtuse, spreading. Fruit 2-3.8 cm., smooth, bright pinkish-orange, pericarp soft-leathery, with 1-4 seeds immersed in pulp. Seed 2.5 cm., almond-like, testa membranous, yellowish, embryo homogeneous.

Distribution: W. Peninsula, Ceylon.

The root bark is used in rheumatism, gonorrhoea, and skin diseases.

Sinhalese: Himbuturvel, Koltalahimbutu—.

RHAMNACEAE.

Trees or shrubs, often scrambling or climbing; branches sometimes thorny, sometimes bearing tendrils. Leaves simple, alternate rarely opposite; stipules small or 0, sometimes changed into prickles. Flowers hermaphrodite or polygamous, small, greenish, in simple or panicled axillary cymes. Calyx 4-5- (rarely 6-) lobed, the lobes triangular, valvate, keeled within. Petals 4-5, rarely 0 or 6, inserted on the throat of the calyx-tube. Disk fleshy and filling the calyx-tube or membranous and lining it. Stamens as many as and opposite to the petals. Ovary free or immersed in the disk, 3- rarely 2-4- celled; style short, simple or 2-4-lobed. Fruit superior or inferior, 3- rarely 4- celled, capsular or drupaceous; sometimes winged. Seeds solitary in each cell.—Genera 40. Species 500.—Cosmopolitan.

A. Scandent, unarmed shrubs. Leaves alternate. Disk filling the calyx-tube. Fruit dry, 1-celled, 1-seeded
  Fruit indehiscent, prolonged above into a linear-oblong wing .... VENTILAGO.

B. Shrubs or trees. Disk filling the calyx-tube. Fruit a dry or fleshy drupe with a 1-3-celled fleshy stone
  1. Leaves prominently 3-nerved .... ZIZYPHUS.
  2. Leaves penninerved .... BERCHEMIA.

C. Shrubs or trees. Disk lining or filling the calyx-tube. Fruit dry or fleshy of 3 (rarely 2 or 4) pyrenes or cocci
  Trees or shrubs. Leaves alternate. Cymes axillary. Fruit indehiscent .... RHAMNUS.

D. Fruit inferior, crowned with the persistent calyx
Fruit 3-winged. Flowers fascicled forming paniculate racemes .. GOUANIA.

Bitter and astringent, diaphoretic and diuretic, cathartic and emetic, emollient and bechic.

The following substances have been isolated:—(1) acids—frangulic, frangulinic, rhamnotannic, succinic, zizyphic—; (2) sugars—galactose, glucose, rhamnose—; (3) anthraquinone derivatives—chrysophanol, emodin, isoemodin—; (4) glucosides—frangulin, glucofrangulin, lokain, rhamnazin, rhamnoxanthin, xanthorhamnetin, xanthorhamnin—; (5) bitters—rhamnocathartin—; (6) pigments—quercetin, rhamnetin, rhamnin—.

OFFICIAL:—*Frangula Alnus* Mil. (Russia).

Rhamnus cathartica Linn. (Belgium, France, Portugal, Turkey); *R. Frangula* Linn. (Austria, Belgium, Denmark, France, Germany, Holland, Italy, Japan, Norway, Portugal, Russia, Sweden, Switzerland); *R. Lotus* Linn.=*Zizyphus Lotus* Lamk. (Portugal); *R. Purshiana* DC. (Austria, Belgium, Denmark, France, Great Britain, Holland, Hungary, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States); *R. Zizyphus* Linn.=*Zizyphus sativa* Desfont. (Portugal).

VENTILAGO Gaertn.

Scandent shrubs. Leaves subdistichous, alternate, petioled; stipules very minute, caducous. Flowers small, in terminal and axillary panicles (rarely fascicles). Calyx 5-fid; tube obconic; lobes spreading, acute, keeled within. Petals 5, deltoid or obcordate, cucullate, involute. Stamens 5, adnate to the base of the petals and a little longer than them. Disk 5-gonous, naked or pubescent, its margin free. Ovary immersed in the disk, subglobose, 2-celled; style very short, compressed; stigmas 2, short. Ripe fruit subglobose, 1-celled, 1-seeded, surrounded at its base or middle by the adherent calyx-tube, the fruit prolonged into a linear or linear-oblong coriaceous apical wing. Seed subglobose, exalbuminous.—Species 10.—Palaeotropics.

1. Leaves 5-10 cm. .... 1. *V. madraspatana.*
2. Leaves 9-15 cm. .... 2. *V. calyculata.*

V. africana Exell. is used medicinally in the Gold Coast.

1. **Ventilago madraspatana** Gaertn. Fruct. I (1788) 223, t. 49, fig. 2; Roxb. Corom. Pl. t. 76.—*V. maderaspatana* Wight Ic. t. 163.—PLATE 238A.

A large much-branched woody climber; young branches and panicles pubescent. Leaves 5-10 by 2.5-3.8 cm., oblong-lanceolate or elliptic-ovate, subacute, entire or more or less crenate, glabrous above, glabrous or puberulous beneath, base rounded or acute; main nerves 4-8 pairs, alternate, ascending; petioles 6-10 mm. long; stipules small, subulate. Flowers greenish, with an offensive odour, 3 mm. diam., in large spreading and drooping leafless pubescent terminal panicles; buds 5-angled; pedicels very short. Calyx pubescent or puberulous outside, glabrescent within; lobes erect, triangular, very acute, keeled on the inner face and with a hard incurved point at the apex within. Petals much smaller than the calyx-lobes, enveloping the stamens and shorter than them. Disk softly pubescent. Ovary pubescent; styles more or less divergent. Nuts about 5 mm. diam., yellowish, globular, supported by the persistent calyx which forms a flat disk at the base of the fruit; wing 3.8-5 cm. long by 8-10 mm. broad, linear-oblong, 1-nerved, rounded at the apex and terminated by the remains of the bifid style.

Distribution: Bombay Presidency: Konkan, Deccan, W. Ghats, S. M. Country; Madras Presidency: Deccan forests from Kistna to Mysore and Coimbatore, Ceylon, Tenasserim.

The powdered root-bark is carminative, stomachic, tonic and stimulant; useful in atonic dyspepsia, debility and slight cases of fever.

The powdered bark (mixed with gingelly oil) is used in South India as an external application for itch and other skin diseases.

On treating this dye-stuff with carbon bisulphide five crystalline substances are extracted, together with a wax and a resinous colouring matter (*Journ. Chem. Soc.;* 1894).

Bengal: Raktapita—; *Bombay:* Kanvel, Lokhandi—; *Canarese:* Haruge, Kubbila, Malamaitra, Pappali, Poppli—; *Central Provinces:* Keoti, Pitti—; *Deccan:* Surichakka—; *Dun:* Kalibel—; *English:* Red Creeper—; *Gujerati:* Ragatarohado—; *Hindi:* Pitti—; *Hyderabad:*

Chorgu—; *Kolami:* Bongasarjom—; *Konkani:* Kanvel—; *Marathi:* Khandvel, Lokhandi, Sakalyel—; *Mundari:* Bongasarjomnari—; *Sanskrit:* Raktavalli—; *Sinhalese:* Yakkaduvel—; *Tagalog:* Salupao, Silipao—; *Tamil:* Pappili, Surul, Surulbattaikkodi, Vembadam—; *Telugu:* Ettashirattalativva, Ettasurugudu, Papri, Putika, Surabi, Suralatige, Surugudu—; *Uriya:* Roktopitto, Sajumalo, Toridi—.

2. **Ventilago calyculata** Tulasne in Ann. Sc. Nat. ser. 4, VIII (1857) 124.—*V. sulfurea* Pierre Fl. For. Cochinch. t. 313, fig. C.—PLATE 238B.

A large evergreen climber with rambling stems up to 25 cm. diam. and 30 m. high, climbing by means of strong woody tendrils. Bark of stems up to about 12.5 cm. diam. smooth with shallow, broad, reticulate woody ridges; of larger stems dark brown or blackish, rough with deep longitudinal fissures. Blaze 5-9 mm., hard, fibrous, pinkish. Twigs greenish, smooth, more or less deeply striate, pubescent when young. Leaves 5-10 by 2.5-6.3 cm., ovate elliptic or elliptic-oblong, base obliquely acute or rounded, apex usually acuminate, entire or crenate, glabrous when mature, subcoriaceous, with 6-8 pairs of arcuate lateral nerves. Petioles 5-10 mm. long. Flowers 3.8-5 mm. diam., pale yellowish green in terminal pubescent panicles up to 23 cm. long. Fruit a subglobose nut, 5 mm. diam., girt about the middle by the persistent calyx-rim and prolonged into a linear pubescent reticulate wing 3.8-5 by 0.75-1 cm.

Distribution: Throughout the hotter parts of India, Burma, Siam, Cochin-China, Laos, Malay Archipelago.

The juice of the bark and young shoots is, in Chota Nagpur, applied to the body as a remedy for the pains which accompany malarial fever. A ring made from the tendril is used as a charm against toothache (Campbell).

Almora: Kalibel—; *Bengal:* Ruktupita; *Bombay:* Kanyel, Karkandichayeh, Papri—; *Canarese:* Gapsandiballi, Haruge, Kuriyadi—; *Central Provinces:* Papri—; *Dehra Dun:* Kalibel—; *Hindi:* Raidhani—; *Kharwar:* Kyonti—; *Kolami:* Bongasarjun, Docsaraj, Noduur—; *Komaon:* Kalalag, Kalibel, Raktapita—; *Marathi:* Sakalyel—; *Mundari:* Bongasarjomnari—; *Ranikhet:*

Kalibel—; *Santal:* Bongasarjom—; *Telugu:* Errashiratalatige—; *Uriya:* Pittoli—.

BERCHEMIA Neck.

Shrubs, usually climbing, or small trees. Leaves alternate, entire or nearly so, with numerous parallel secondary nerves. Flowers bisexual or polygamous, fascicled, the fascicles often arranged in spikes or panicles. Calyx 5- rarely 6- lobed. Petals 5, rarely 6. Disk lining the calyx-tube, margins free. Ovary sunk in the disk but not confluent with it, 2-celled; style 2-fid. Drupe hard or fleshy, seated on the persistent calyx-tube; stone 2-celled, 2-seeded.—Species 15.—Palaeotropics, Atlantic, N. America.

The roots are anticachectic.

B. discolor Hemsley is used medicinally in Zambesi, *B. racemosa* Sieb. & Zucc. in Indo China, *B. volubilis* DC. in Carolina and Virginia.

1. **Berchemia lineata** DC. Prodr. II (1825) 23.—*B. Edgeworthii* Laws in Hook. f. Fl. Brit. Ind. I, 638.

A deciduous shrub 0.9-2.4 m. high, the stems occasionally reaching 4.5 m. high and 2.5 cm. diam. when supported by surrounding vegetation. Stems frequently arched and rooting in contact with the ground. Twigs terete, glabrous. Bark dark green or blackish, quite smooth. Leaves variable in size, 1.2-3.8 by 0.7-2 cm., elliptic or oblong, apex rounded or obtuse, entire, base rounded, glabrous, thin, with 6-8 pairs of conspicuous parallel secondary nerves, pale and glaucous beneath. Petiole 5-10 mm. long. Flowers 3.8-5 mm. diam., yellowish green, in axillary clusters of 2-4. Pedicels 2.5-5 mm. long. Drupe 7.5-10 mm. long, ovoid or oblong (cylindric till ripe), purplish black with a waxy bloom, containing a single white stone, succulent.

Distribution: Baluchistan, Trans-Indus, Himalaya 4,500—9,000 ft. from the Indus eastwards to Bhutan.

In Loralai it is considered a cure for ferver (Hughes-Buller).

Garhwal: Kameti—; *Jaunsar:* Angari—; *Kumaon:* Kameti—; *Loralai:* Sperabuti—; *Pushtu:* Torbutei—.

ZIZYPHUS Tourn. ex Linn.

Trees or erect or climbing shrubs, usually armed with sharp straight or hooked thorns, which are transformed stipules; thorns solitary or in pairs, usually one straight, the other curved. Leaves alternate, subdistichous, 3-5-ribbed. Flowers small, greenish or yellowish, in axillary fascicles or in sessile or peduncled cymes. Calyx with broadly obconic tube and 5 triangular acute lobes keeled within, lobes valvate. Petals 5, or rarely 0, cucullate, deflexed. Stamens 5, opposite to and enclosed in the petals and usually longer than them. Disk 5-10-lobed, flat or pitted, the margin free. Ovary sunk in or adnate at the base to the disk, 2-4-celled; styles 2-3, rarely 4, free or connate; stigmas small papillose. Fruit a globose or oblong drupe, with a woody or bony 1-4- celled and -seeded stone. Seed plano-convex; albumen 0 or scanty; cotyledons thick; radicle short. —Species 40.—Mostly Indo-Malayan, a few in Africa, Australia, America.

A. Petals 5
   Styles connate to the middle
   a. Fruit exceeding 13 mm. diam. Leaves tomentose beneath .... 1. *Z. jujuba.*
   b. Fruit under 13 mm. diam.
      1. Leaves glabrous, 2.5-7.5 cm. .... 2. *Z. trinervia.*
      2. Leaves tomentose on both sides .... 3. *Z. nummularia.*
      3. Leaves closed with silky hairs beneath .... 6. *Z. oenoplia.*
      4. Leaves glabrous on both sides, 2-6.3 cm. .... 4. *Z. sativa.*
B. Petals absent .... 5. *Z. rugosa.*

Chiefly noted for the emollient and pectoral properties of the fruits.

The following are used medicinally in Europe—*Z. lotus* Lam., *Z. vulgaris* Lam.—; in Syria and Palestine—*Z. spina-Christi* Willd.—; in Persia and Afghanistan—*Z. jujuba* Lam.—; in Japan and China —*Z. vulgaris* Lam.—; in Indo China and the Philippine Islands—*Z. jujuba* Lam.—; in North Africa— *Z. lotus* Lam.—; in Egypt—*Z. spina-Christi* Willd.—; in Tropical Africa—*Z. jujuba* Lam.—; in Guinea—*Z. jujuba* Lam., *Z. mucronata* Willd.—; in South Africa —*Z. helvola* Sond., *Z. mucronata* Willd., *Z. zeyheri* Sond.—; in Brazil—*Z. joazeiro* Mart.—.

OFFICIAL:—The fruit of *Rhamnus Zizyphus* Linn. (*Z. sativa* Desfont.) and *Rhamnus Lotus* Linn. (*Z. Lotus* Lamk.) in Portugal.

1. **Zizyphus jujuba** Lam. Encycl. III (1789) 318; Wight Ic. t. 99; Brandis For. Fl. t. 17.—PLATE 239.

A small subdeciduous tree with dense spreading crown, commonly 0.6 m. girth and 6 m. high. Bark blackish to grey or brown, rough, regularly and deeply furrowed, the furrows about 1.2 cm. apart. Blaze 9-13 mm., short fibre, pink with or without paler streaks, the juice turning purplish black on the blade of a knife. Branches usually armed with spines, mostly in pairs, one straight, the other curved. Young shoots more or less densely pubescent. Leaves 3-6.3 by 2.5-5 cm., oblong or ovate, usually minutely serrulate or apex distinctly toothed, obtuse, base oblique and 3-nerved, nerves depressed on the glabrous shining upper surface, densely clothed beneath with white or buff tomentum. Petiole 2.5-10 mm. long. Flowers 3.8-5 mm. diam., greenish, in dense axillary tomentose cymes or fascicles 1.2-1.9 cm. long. Drupe 1.2-2.5 cm. diam., globose, first yellow then orange and finally reddish brown, containing a single stone surrounded by fleshy pulp.

Distribution: Indigenous and naturalized throughout India, Burma and Ceylon, in the outer Himalaya up to 4,500 ft.—China, Afghanistan, Africa, Australia.

The root is bitter and cooling; cures "kapha"; biliousness, headache.— The bark cures boils; good in dysentery and diarrhœa. — The leaves are bitter and cooling; cure "kapha", biliousness, diarrhœa; antipyretic; reduce obesity. The ripe fruit (*sauvira*) is cooling, indigestible, aphrodisiac, tonic, laxative, invigorating; removes biliousness, burning sensation, thirst, vomiting; good in consumption and blood diseases. A small variety (*Kola*) is hot and tasty; laxative; removes "vata" and "kapha"; causes a burning sensation in the body. A still smaller variety (*Karkandhu*) is sour, acrid, sweet, oily, bitter; indigestible; removes "vata" and "pitta". The unripe fruit removes "vata" and causes "kapha". The dry fruit is a laxative and appetiser; removes impurities from the blood; allays thirst.—The seeds are acrid and sweetish; tonic, aphrodisiac;

cure eye diseases, cough, asthma, thirst, "vata", vomiting, burning sensation, biliousness; good in leucorrhœa (Ayurveda).

The root and bark are tonic.— The leaves are anthelmintic; good in stomatitis and gum bleeding; heal wounds, syphilitic ulcers; cure asthma; good in liver complaints.— The flowers afford a good collyrium in eye troubles.— The unripe fruit increases thirst; lessens expectoration and biliousness. The ripe fruit is sweet, sour, and has flavour; not good for digestion; causes diarrhœa in large doses; useful in fevers, and for wounds and ulcers.—The seed is astringent; tonic to the heart and the brain; allays thirst (Yunani).

The fruit is said to be mucilaginous, pectoral, and styptic. The berries are considered to purify the blood and to assist digestion. The bark is said to be a remedy in diarrhœa. The root is used in decoction in fever, and as a powder it is applied to ulcers and old wounds. The leaves form a plaster in strangury.

The young leaves are pounded with those of *Ficus glomerata* and applied to scorpion stings in the Konkan.

In Cambodia the bark is used as an astringent in gingivitis and dysentery; the leaves are used in conjuctivitis, and are prescribed in antifebrile baths and lotions.

In the Moluccas the bark is employed as a remedy for diarrhœa.

"I have tried the root as a febrifuge, but find it slow in its action. In 17 cases treated with the decoction of the root, the drug did not check the paroxysms until about the seventh or eighth day. I believe it acts more as a tonic than an antiperiodic" (Evers; *Ind. Med. Gazette*, October, 1875).

Te leaves are not an antidote to scorpion venom (Caius and Mhaskar).

Arabic: Aunnabehindi, Nabig, Sidr—; *Baigas:* Bor—; *Baluchistan:* Ber, Berwarter, Kunar—; *Bengal:* Bogri—; *Bhil:* Renga—; *Bolan:* Kunar—; *Bombay:* Bhor, Bhurmi, Bor, Bordi, Bur—; *Burma:* Zi, Ziben—; *Cambodia:* Putrea—; *Canarese:* Badari, Bogari, Bore, Egasi, Elasi, Ilanji, Ilisi, Jelachi, Karkhandhu, Yalachi—; *Central Provinces:* Bher, Bori—; *Chinese:* Hong Tsao, Lang Tsao, Ta Tsao, Tsao Tse—; *Deccan:* Ber—; *English:* Chinese Date, Indian Cherry, Indian Jujube, Indian Plum—; *French:*

Chicourlier, Croc de chien, Epine à cerises, Guindoulier, Jujubier, Masson, Massonnier—; *Gond:* Ringa—; *Gujarat:* Ber, Bor, Bordi, Boyedi—; *Hasada:* Bakarakkuridaru, Bakarkuriddaru—; *Hausa:* Magadiya—; *Hindi:* Baer, Ber, Beri—; *Indo China:* Hung tao, Tao, Tao nhuc—; *Italian:* Giuggiolo—; *Kolami:* Janumjan, Janumjarom, Jomjanum—; *Konkani:* Ber, Bor—; *Kumaon:* Ber, Guter, Khalis—; *Lambadi:* Ber—; *Languedoc:* Bengha, Dindoulo—; *La Reunion:* Jujubier, Masson—; *Magahi:* Jibang—; *Malayalam:* Badaram, Badari, Kolam, Lanta, Perintutali—; *Marathi:* Baher, Ber, Bera, Bhor, Bor, Bora—; *Naguri:* Doraridaru—; *Nepal:* Baer—; *North-Western Provinces:* Ber, Bera—; *Persian:* Kanar, Kunar, Nabik—; *Philippines:* Manzanas, Manzanitas—; *Porebunder:* Boedi, Bordi, Bori—; *Portuguese:* Jujubeira, Maceira, Macieira—; *Punjab:* Ber, Beri, Unab—; *Pushtu:* Berra—; *Rajhanshi:* Bogri—; *Rajputana:* Ber—; *Sakalave:* Makonasy, Mokanasy, Voandamoty—; *Sanskrit:* Ajapriya, Badari, Balashta, Dridhabija, Dviparni, Ghonta, Gudaphala, Kantaki, Karkarmadhu, Koli, Kuvali, Madhuraphala, Mahadebara, Nakhi, Nripabadari, Nripeshta, Prithukoli, Phalashayshira, Rajabadari, Rajakoli, Rajavallabha, Sukshmaphala, Sukshmapatrika, Srigalakoli, Svachha, Sukrapriya, Suphala, Tanubija, Ubhayakantaka—; *Santal:* Dedhaori, Janum, Jomjanum—; *Sind:* Ber jangri—; *Sinhalese:* Ilanda, Mahadebara, Masaka—; *Swahili:* Mkunazi—; *Tamil:* Adidaram, Attiram, Ilandai, Iradi, Iratti, Koli, Kondai, Kullari, Kulvali, Padari, Sivagam, Vadari, Vettiram, Veyam—; *Telugu:* Badaramu, Badari, Gangaregu, Gangarenu, Karkhanduvu, Regu, Renu—; *Tigrinia:* Abbathere, Gaba-artgi, Ghewwa-artgi—; *Tulu:* Bogari—; *Urdu:* Ber—; *Uriya:* Barkoli, Bodokoli, Bodori, Koli.

2. **Zizyphus trinervia** Roxb. Hort. Beng. (1814) 17 (non Poir.).—*Z. glabrata* Heyne; Wight. Ic. t. 282.—Plate 240A (under *Z. glabrata* Heyne).

A small unarmed tree. Leaves 2.5-7.5 by 1.6-3.8 cm., elliptic, subobtuse, often mucronate, serrate (the serratures with short callous points), prominently 3-nerved from the base, glabrous, shining, base more or less oblique, rounded or subacute; petioles 3-12 mm. long;

stipules filiform, caducous. Flowers greenish yellow, in axillary peduncled cymes scarcely 1.2 cm. long. Calyx finely pubescent outside; lobes triangular, keeled within, deflexed. Petals small, shorter than the recurved stamens, obtriangular, cuneate. Disk 10-lobed, not grooved. Filaments flattened. Ovary 2-celled; styles 2, united to the middle. Fruit 1 cm. diam., globose or obovoid, somewhat rugose, 1-2-celled, yellow when ripe.

Distribution: Gujarat, W. Ghats of the Madras Presidency in Coimbatore, Nilgiris and Anamalais to S. Travancore at low elevations.

A decoction of the leaves is given to purify the blood in cases of cachexia, and as an alterative in old venereal affections.

Canarese: Chitipala, Chuchipali—; *English:* Jagged Jujube—; *Malayalam:* Karkala—; *Sanskrit:* Vatadala—; *Tamil:* Kadikkai, Karukava, Karukkattan, Karukkuvachi, Karukkuvali, Kattigai, Kottai, Mullukkarukkuva, Kurkatura, Muttagam—; *Telugu:* Kakupala—.

3. **Zizyphus nummularia** Wight & Arn. Prodr. (1834) 162. —*Z. microphylla* Roxb. Hort. Beng. 17; Fl. Ind. I (1832) 613.— PLATE 240B.

A small shrub branched from near the root; branches divaricate, slender, zigzag; bark light-coloured. Leaves 1.2-2 cm., orbicular or ovate, spinous-dentate, clothed beneath with a whitish or buff tomentum, less densely tomentose above; petioles 3-6 mm. long, tomentose; stipular thorns usually in pairs, one straight, sharp and slender, nearly as long as the leaf, the other short, hooked. Flowers in axillary sessile pubescent cymes; buds globose; pedicels short. Calyx pubescent outside, cleft about half way down; lobes triangular-ovate, keeled on the inner face for about half their length. Petals cuneate, rounded or truncate at the apex, longer than the stamens. Filaments deflexed together with the enclosing petals. Disk 10-lobed, with a pit opposite to each lobe. Ovary 2-celled; styles 2, united to above the middle. Drupes globose, 8 mm. diam., glabrous, red when ripe, edible.

Distribution: Dry and arid regions of the Punjab, Waziristan, Sind, Baluchistan, W. Rajputana, Cutch, Kathiawar, Gujarat, Khandesh, S. M. Country.—Persia.

The fruit is sweet, sour; wholesome, appetiser, stomachic; cures "kapha"; may increase biliousness (Ayurveda).

The leaves are applied in scabies and to boils; the smoke is used for colds in the head and nasal discharges; the decoction is used as a hip bath for joint pains, as a gargle in sore throat and bleeding gums (Yunani).

In the Punjab the fruit is considered to be cool and astringent, and is used in bilious affections.

Ajmere: Bhor, Jhalbhor—; *Arabic:* Zariab—; *Bundelkhand:* Jand, Kantaber—; *Canarese:* Mulluhannu, Paraji, Parapele, Parpuli, Purpalli—; *Central Provinces:* Pali—; *English:* Wild Jujube—; *Gujarat:* Adbaubordi, Chanyabor, Gangar, Jhardanbor, Khetraubordi—; *Hindi:* Jarberi, Jhadiaber, Jharber, Jharberi—; *Marathi:* Gangar, Janglar, Junglebor—; *North-Western Provinces:* Ber, Birar, Jharber, Jhari, Kanta, Malla—; *Persian:* Shabaraka—; *Porebunder:* Paleran—; *Punjab:* Bal, Ber, Birar, Birota, Jand, Jarberi, Jharberi, Jharpala, Kokanber, Kokniber, Malla, Mallaber, Mallan, Maraber, Pala, Zari—; *Pushtu:* Karkan, Karkana, Karkanra—; *Rajputana:* Ber, Bhor, Jhalbhor—; *Sanskrit:* Ajapriya, Bhubadari, Bhukamtaka, Bhurdaribalakapriya, Sukshmaphala—; *Sibi:* Kavkanr—; *Sind:* Ber, Gangra, Jangra, Jangri, Nandojangro—; *Tamil:* Korgodi—; *Telugu:* Nelaregu—; *Trans-Indus:* Karkan—; *Urdu:* Zariab—.

4. **Zizyphus sativa** Gaertn. Fruct. I (1788), 202; Parker Fl. Punj. (1918) 85.—*Z. vulgaris* Lam. Encycl. III (1789) 316; Roxb. Fl. Ind. I (1832) 609.—Plate 241 (under *Z. vulgaris* Lam.).

A small deciduous tree, often shrubby, quite glabrous, branches of young plants armed with very short spines, one straight, 2.5 cm. long, the other much shorter, recurved, older trees usually unarmed, flowering shoots about 15-20 cm. long, often fascicled on dwarf branches. Leaves 2.5-5 cm. long, ovate-lanceolate, glabrous, crenate-serrate, oblique, 3-nerved; petiole 2.5-7.5 mm. long. Flowers in few-flowered, axillary clusters. Petals clawed, tips truncate. Disk obscurely lobed. Styles 2, united to the middle. Drupe ellipsoid, 2 cm. long, stone tuberculate.

Distribution: Punjab, Punjab Himalaya up to 6,500 ft., eastwards to Bengal, N.-W. Frontier Province, Baluchistan.—Persia, Mediterranean.

The bark is used to heal ulcers and wounds.— The gum is good in eye diseases.— The leaves are laxative; used in scabies, throat trouble, burning of the body.—The fruit is sweet, sour; expectorant; purifies and enriches the blood; good in chronic bronchitis, fever, enlargement of the liver.— The seeds are good in dry cough and for skin eruptions (Yunani).

The drupes are emollient and pectoral.

A syrup of the dried fruit is used in the Punjab for bronchitis.

Arabic: Unnab—; *Bombay:* Ranbor, Unnab—; *Catalan:* Ginjoler—; *Chinese:* K'u Tsao, Suan Tsao, Tsao—; *Dutch:* Jobenboom—; *English:* Common Jujube, Jujube—; *French:* Jujubier, Jujubier officinal—; *Georgian:* Unabi—; *German:* Brustbeeren, Judendornbeeren—; *Greek:* Zizypha—; *Hindi:* Ban, Ber, Kandiari, Kandika, Pitniber, Simli, Singli, Titniber—; *Italian:* Giuggiolo—; *Japanese:* Naatime—; *Kashmir:* Ban, Barj, Konkamber, Phitni, Simli, Sinjli—; *Malta:* Jujube, Giuggiolo, Zizzolo, Zenzero, Linzel—; *North-Western Provinces:* Ber, Bheri, Ghuter, Kandiari, Khalis, Kul, Sinjili—; *Persian:* Kunar, Sinjidijalani, Unap—; *Portuguese:* Maceira de anafega—; *Punjab:* Amlai, Amni, Amnia, Amra, Barari, Ber, Beri, Ganyeri, Imla, Kandiari, Kandika, Kokamber, Phitni, Pitni, Relnu, Sanjit, Shamor, Simli, Sinjli—; *Pushtu:* Karkamber—; *Russian:* Grudnaiya pridorojnaiya igla—; *Sind:* Anab, Ber—; *Spanish:* Azufaifo—; *Turkish:* Unap—; *Urdu:* Unab—.

5. **Zizyphus rugosa** Lam. Encycl. III (1789) 319; Wight Ic. 339.—*Z. glabra* Roxb. Fl. Ind. I (1832) 614.—*Z. latifolia* Roxb. l. c. 607.—PLATE 242.

A large straggling armed shrub sometimes climbing; young branches clothed with fulvous tomentum. Leaves 5-12.5 cm. long, broadly elliptic, shortly acuminate, denticulate, glabrous above, fulvous-tomentose beneath, base oblique, often cordate; petioles 6-12 mm. long, tomentose; prickless from a broad base, solitary, short, recurved, tomentose except the tips. Flowers in long-peduncled tomentose cymes arranged along usually leafless spinous branches forming a panicle (the cymes sometimes turned to one side); buds

globose and as well as the peduncles and pedicels densely tomentose. Calyx pubescent outside; lobes ovate acute, the keel on the inner face reduced to a line. Petals 0. Disk 5-lobed. Ovary 2-celled. Styles 2, connate below the middle. Drupe 6-8 mm. diam., globose, or pyriform, white when ripe; stone thin, 1-celled, 1-seeded.

Distribution: Throughout India and Ceylon.

The flowers, with an equal quantity of the petioles of the betel leaf and half as much lime, are given in 4-grain pills twice a day for menorrhagia.

Bombay: Toran, Torne, Turan—; *Burma:* Mitha tabu, Myaukzi, Tabu—; *Canarese:* Belahadukina, Bilisurimullu, Kottamullu, Mahigotte—; *Central Provinces:* Churna, Suran—; *Ceylon:* Churai—; *Dehra Dun:* Ber, Bhand—; *Hindi:* Churna, Suran—; *Kharwar:* Kataila—; *Kolami:* Tshirka—; *Lambadi:* Daknimevaro—; *Malayalam:* Malantutali, Todali, Tutali—; *Marathi:* Churna, Suran, Turan—; *Melghat:* Churni—; *Nepal:* Harraybaer, Kantabaer, Rukhbaer—; *Nilghiris:* Swarm—; *Oudh:* Dhaura, Dhauri—; *Rajbanshi:* Bogri—; *Santal:* Sekra—; *Saora:* Gotti, Terma—; *Sinhalese:* Maha-erramiya—; *Tamil:* Kattilandai, Todari—; *Telugu:* Pinduparighamu—; *Uriya:* Kanokoli, Katokoli, Simukoli, Sunokoli—.

6. **Zizyphus oenoplia** Mill. Gard. Dict. ed. 8 (1768) no. 3. —*Rhamnus oenoplia* Linn. Sp. Pl. (1753) 194 (*R. oenopolia*).

A straggling shrub often semiscandent by its prickles; young branches rusty-tomentose. Leaves numerous, distichous, 2.5-6.3 by 2-2.5 cm., ovate or ovate-lanceolate, acute or subacuminate, with pubescent or tomentose tips, minutely denticulate, glabrous or pubescent above, densely silky with appressed rufous hairs beneath, base very oblique; main basal nerves usually 3, with numerous ascending branches, the lowest branch on the large side of the leaf starting almost, but usually not quite, from the base; petioles 6-8 mm. long; stipular prickle 1, stout, short, hooked, pubescent except the tip. Flowers 12-20, in subsessile pubescent paniculate cymes which are slightly longer than the petioles. Calyx hairy outside; lobes ovate, acute, keeled to the middle or a little below it. Petals obovate,

cuneate, shorter than the calyx-lobes exceeding the stamens. Disk with 10 short deeeply pitted lobes glabrous. Styles united almost to the apex. Drupe edible, 6 mm. diam., globose or obovoid, 1-(rarely 2-) celled, black, shining; pulp scanty; stone woody or bony.

Distribution: Throughout the hotter parts of India, Ceylon.—Tropical Asia and Australia.

A decoction of the root bark is used to promote the healing of fresh wounds.

Among the Mundas the fruit is used as an ingredient in the preparation of stomach-ache pills.

Bengal: Mahkoa, Siakul, Shyakul—; *Burma:* Tauhzi, Tawzinme—; *Canarese:* Barige, Challe, Hurasurah, Kanneri, Karisurimullu, Purgi, Surimullu—; *Central Provinces:* Irun—; *Ceylon:* Churai, Perilantai—; *Chanda:* Yeruni—; *English:* Jackal Jujube—; *Hindi:* Makai—; *Lambadi:* Kalaborero—; *Malay:* Akar kuku balam, Akar kuku tupai, Kukulang—; *Malayalam:* Kottavalli, Tutalimullu—; *Marathi:* Kanerballi, Makor—; *Mundari:* Bagriba, Birjanum, Janumbili, Janumjarom, Jome-janum—; *North-Western Provinces:* Bamolan, Mako, Siyahkul—; *Oudh:* Makai—; *Saharampur:* Makoh—; *Sanskrit:* Bahukantaka, Dusparsa, Karkhandu, Madhura, Srigalakoli—; *Sinhalese:* Erraminyavel, Hineraminiya—; *Tamil:* Ambulam, Amburi, Surai, Suraimullu, Suraiyilandai—; *Telugu:* Banka, Paraki, Parighamu, Parimi—; *Tulu:* Turimullu—; *Uriya:* Barokoli, Kontakoli—.

RHAMNUS Tourn. ex Linn.

Shrubs or trees. Leaves alternate (rarely subopposite), petioled, penninerved; stipules small, deciduous. Flowers hermaphrodite or polygamous, axillary, racemose or cymose, the cymes fasciculate. Calyx 4-5-fid; tube urceolate; lobes keeled within. Petals 4-5 or 0, inserted on the edge of the disk. Disk lining the calyx-tube, the margin thin. Stamens 4-5; filaments very short. Ovary free, ovoid 3-4-celled, attenuated into a 3-4-fid style; stigmas obtuse, papillose. Fruit a berry-like drupe, oblong or globose, girt at the base by the small calyx-tube; pyrenes 2-4, dehiscent or indehiscent, 1-seeded.

Seeds obovoid; testa membranous or crustaceous; albumen fleshy; cotyledons flat, recurved at the margins; radicle short.—Species 100. —Cosmopolitan.

A. Flowers 4-merous	1.	*R. dahuricus.*
B. Flowers 5-merous, unarmed		
1. Leaves elliptic or narrowly elliptic, shortly acuminate, closely serrate, subcoriaceous	2.	*R. wightii.*
2. Leaves ovate, shortly acuminate, membranous	3.	*R. purpureus.*
3. Leaves elliptic-ovate to oblong-lanceolate, acute or sub-acuminate, the old leaves pubescent on the nerves only	4.	*R. triqueter.*
4. Leaves oblong or elliptic-oblong, shortly acuminate, dark green and shining above	5.	*R. nipalensis.*

The genus is well known for the cathartic properties of its fruits and barks.

The following species are used medicinally in Europe—*R. alaternus* Linn., *R. alpina* Linn., *R. cathartica* Linn., *R. frangula* Linn., *R. injectorious* Linn., *R. oleoides* Linn., *R. pumila* Linn., *R. saxatilis* Jacq., *R. tinctoria* W. K.—; in Indo China—*R. japonicus* Max., *R. nipalensis* Laws.—; in China and Japan—*R. japonicus* Max.—; in the Philippine Islands—*R. wightii* W. &. A.—; in North America—*R. alnifolia* L'Her., *R. crocea* Nutt., *R. purshianus* DC.—; in Mexico—*R. californica* Esch.—; in South Africa—*R. prinoides* L'Herit., *R. zeyheri* Sond.—.

Official:—The fresh fruit of *R. cathartica* Linn. (Belgium, France, Portugal, Turkey); the stem bark of *R. frangula* Linn. (Austria, Belgium, Denmark, France, Germany, Holland, Italy, Japan, Portugal, Russia, Sweden, Switzerland) and *R. purshiana* DC. (Austria, Belgium, Denmark, France, Great Britain, Holland, Hungary, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States).

1. **Rhamnus dahuricus** Pall. Reise Russ. Reichs Theil 3 (1776) 721 (*dauurica*).—*R. virgatus* Roxb. Hort. Beng. (1814) 17. —Plate 243B.

An erect deciduous shrub 1.8-4.5 m. high and stem up to 0.9 m. girth. Branches often ending in a sharp thorn. Young shoots minutely pubescent. Young stems and branches quite smooth, the

bark peeling off in lateral papery rolls. Bark on old stems dark reddish brown, rough. Blaze 5-9 mm., bright orange or orange-brown, with numerous fine white fibres running through. Leaves opposite or subopposite (fascicled on dwarf shoots), 2.5-10 cm. long, variable from narrowly elliptic-lanceolate to broadly ovate or obovate, thin, membranous, slightly pubescent on both surfaces, acuminate, base acute, crenate-serrate, lateral nerves arcuate. Petiole 5-10 mm. long, pubescent. Flowers 5 mm. diam., pale green, 4-merous, unisexual in many-flowered axillary clusters. Pedicels 5-7.5 mm. long, filiform. Fruit 5-9 mm. diam., globose, shining, black, containing 1-2, usually 2, dark brown seeds embedded in a purplish juicy pulp.

Distribution: Trans-Indus, Punjab Himalaya, 2,500—9,000 ft., between 5,000 and 10,000 ft. from the Indus eastwards to Simla and Bhutan, W. Ghats of Madras Presidency 5,000—7,000 ft.

The fruit which is bitter, even when ripe, has emetic and purgative properties, and is given in affections of the spleen.

Jaunsar: Chaulda, Thanthar—; *Hindi:* Chadua, Chato, Chedwala—; *Kumaon:* Spiti—; *Punjab:* Chakra, Chatr, Chetain, Dadur, Gogsa, Kanji, Mamral, Mutni, Nior, Pajja, Phipai, Reteon, Romusk, Seta, Shomfol, Sindrol, Sitapajja, Tadru, Thalot—; *Pushtu:* Wurak—; *Tibet:* Nail, Tsapo—.

2. **Rhamnus wightii** Wight & Arn. Prodr. (1834) 164; Wight Ic. t. 159.—PLATE 244B.

A large glabrous, unarmed shrub. Leaves alternate (rarely a few subopposite), 6.3-10 by 2.2-4.7 cm., ovate-oblong, acuminate, finely serrate, glabrous base rounded or subacute; petioles 1-1.5 cm. long, puberulous. Flowers in axillary fascicles, or in fascicles along an elongate, axillary rhachis; pedicels shorter than the petioles. Calyx pubescent outside, cleft about half way down; lobes triangular, keeled on the inner face. Petals minute, lanceolate, flat. Stamens 5. Ovary 3- or 4- celled; styles 3 or 4, connate half way up. Berry 5 mm. diam., globose, supported by the persistent calyx and tipped with the remains of the styles, smooth, reddish purple when ripe.

Distribution: W. Ghats in the Nilgiris and Pulney Hills up to 7,000 ft., Ceylon (apparently not in Bombay Presidency except cultivated in a few isolated places).

In the Western Peninsula the bark is in much repute on account of its tonic, astringent and deobstruent properties.

The bark is used as a substitute for that of *Aphanomixis polystachia* and is believed to have the same properties.

Bombay: Raktarohida, Raktrorar, Rugtrorar—; *English:* Indian Buckthorn—; *Sanskrit:* Raktarohita—; *Tagalog:* Cabatiti—; *Tamil:* Peyppula—.

3. **Rhamnus purpureus** Edgew. in Trans. Linn. Soc. XX, 44.—Plate 243A.

A large deciduous shrub with spreading branches or occasionally a small tree up to 7.5 m. high and 23 cm. diam. Young shoots minutely puberulous. Twigs with numerous pale lenticels, emitting a foetid smell when bruised, sometimes purplish. Bark pale grey or ashy, smooth. Blaze 7.5-10 mm., orange-brown with or without yellow bands, the innermost layer yellowish, the whole interspersed with white thread-like strands, often tinged with chlorophyl towards the exterior. Leaves alternate, 5-15 cm. long, elliptic obovate or oblong, acuminate, thin, membranous, pubescent beneath when quite young, remaining bearded in the axils of the nerves but otherwise glabrous when mature, serrate, with 7-11 pairs of strong secondary nerves depressed on the upper surface. Petiole 7.5-12 mm. long. Flowers 3.8-6 mm. diam., greenish purple, 5-merous, bisexual, in axillary clusters. Pedicels 2.5-10 mm. long. Fruit 7.5-10 mm. diam., globose, shining, first pink then black when fully ripe.

Distribution: W. Himalaya from Kashmir to Kumaon up to 9,000 ft.

In Hazara the fruit is used as a purgative.

Jaunsar: Lhith, Luhish—; *Punjab:* Batsinjal, Chaterni, Kari, Karn, Kunji, Mimarari, Rangak, Rari, Tadru, Tandra, Tunani, Tundhi, Zanani—.

4. **Rhamnus triqueter** Laws. in Hook. f. Fl. Brit. Ind. I (1875) 639.—Plate 244A.

An evergreen shrub or small tree up to 6 m. high and 0.9 m. girth. Bark dark brown or blackish, rough, exfoliating in small irregular woody scales. Blaze 6 mm., orange-brown with coarse

whitish fibres running through. Shoots grey-tomentose when young. Twigs with numerous small circular lenticels. Leaves 6.3-14 by 2.5-6.3 cm., ovate-oblong or elliptic, acute, base usually rounded, minutely crenate-serrate, subcoriaceous, minutely pubescent and dull green above, finely grey-tomentose beneath, with 8-12 pairs of arcuate secondary nerves prominent beneath. Petiole 7.5-25 mm. long, grey-tomentose, channelled above. Flowers 2.5-5 mm. diam., yellowish green, 5-merous, bisexual, in grey-tomentose cymes which are arranged in axillary racemes 2.5-7.5 cm. long, usually bearing a few small leaves. Pedicels 2.5 mm. long or less. Fruit 5-7.5 mm. diam., globose or slightly obovoid, indistinctly 3-lobed, purplish black. Seeds 2-4.

Distribution: Trans-Indus, Himalaya and sub-Himalayan tract from the Indus eastwards to Kumaon between 3,000—7,000 ft., Salt Range, very likely introduced on a few hills of the Bombay Deccan.

The bark is used as a tonic, astringent, and deobstruent.

Almora: Gaunta—; *Dehra Dun:* Gaunt—; *Garhwal:* Gaunth—; *Jaunsar:* Katheru—; *North-Western Provinces:* Ghant, Gogsa—; *Punjab:* Gardhan, Gudlei, Phagora, Phulla, Rangrek—.

5. **Rhamnus nipalensis** Laws in Hook. f. Fl. Brit. Ind. I, 640.

A suberect or rambling shrub, with long slender glabrous branches, or pubescent only on the younger parts. Leaves 7.5-15 by 3-5 cm., oblong or elliptic-oblong, shortly acuminate, serrate, membranous or subcoriaceous, dark green and shining above. Flowers in simple or compound glabrous racemes, shortly pedicellate, small, green, pubescent. Petals 5, oblong, concave. Fruit 6 mm., broadly obovate, blackish red.

Distribution: Central and E. Himalaya, Khasia Hills, Assam.

In Indo China the fruits pounded and macerated in vinegar are prescribed in herpes.

Indo China: Cong cua, Cut lon—.

Gouania Jacq.

Unarmed shrubs, climbing by means of tendrils on the branchlets and at the base of the inflorescence. Leaves alternate, penninerved,

petiolate; stipules lanceolate, deciduous. Flowers small, polygamous, in fascicles in interrupted axillary or terminal spikes or racemes. Calyx-tube short, obconic; lobes 5. Peals 5, inserted below the margin of the disk, cucullate. Disk flat or concave, filling the calyx-tube, with 5 rounded or horn-like lobes alternate with the stamens. Stamens 5, enclosed within the petals. Ovary sunk in the disk, 3-celled; style 3-cleft; stigmas minute, papillose; ovules solitary. Fruit coriaceous, inferior, tipped by the persistent calyx-lobes, of 3 separable indehiscent dry mericarps, attached to a central filiform receptacle, and produced on each side in rounded wings. Seeds plano-convex, obovate; testa hard, shining; albumen fleshy; cotyledons ovate, cordate at base, retuse at apex; radicle small. — Species 45. — Tropical and subtropical.

The genus has febrifugal properties.

G. longipetala Hemsl. is used medicinally in the Gold Coast, *G. tiliaefolia* Lam. in Madagascar, *G. striata* Rich. in French Guiana.

1. **Gouania leptostachya** DC. Prodr. II (1825) 40; Roxb. Corom. Pl. I, t. 95 (non Lam. neque Dalz. & Gibs.).—PLATE 245.

A large shrub climbing by means of terminal tendrils, branches smooth, glabrous or nearly so. Leaves alternate, 5-10 by 3.8-6.3 cm., ovate, abruptly acuminate, base truncate or cordate, 3-nerved or 5-nerved by an additional smaller pair, more or less pubescent beneath when young, lateral nerves rather conspicuous, 4-5 pairs, arcuate; petiole 7.5-18 mm. long, obscurely glandular at the top; stipules deltoid, often with persistent bases and deciduous tips. Flowers 3.8 mm. across, white, polygamous, fascicled, the fascicles arranged in axillary and terminal spike-like racemes, 15-25 cm. long, often panicled at the ends of vigorous shoots. Rhachis pubescent or tomentose; fascicles in the axils of deciduous, linear, acute bracts 1.75 mm. long; pedicels 1.2 mm. long. Calyx saucer-shaped, lobes 5 (-6), equalling the tube, keeled at the tips within. Petals 5 (-6), inserted below the margin of the disk, folded round the stamens. Stamens 5 (-6) inserted on the margin of the disk, not longer than the petals; filaments narrowed upwards. Disk glabrous, filling the calyx-tube, the margin produced in front of each

calyx-lobe into a horn-like process (apt to be taken for staminodes). Ovary inferior, sunk in the disk, 3-celled; style short, 3-fid; stigmas minute. Fruit capsular, 1.2 cm. long, 3-winged dehiscent, tipped by the persistent calyx-tube; seeds 3, dark brown, polished, obovate, 3.8 mm. long, the one or two inner facets concave, the outer convex.

Distribution: N. Circars, Sub-Himalayan tract from the Kangra District (Punjab) eastwards to Kumaon (1,000—3,000 ft.) and Assam and Khasia Hills (4,000 ft.), Banda, Burma, Tenasserim, Malay Peninsula.—Java.

The leaves are used by the Lepchas to make poultices for sores (Gamble).

Burma: Thayawnyonway—; *Canarese:* Shingarballi—; *Lepcha:* Tungcheongmonrik—; *Nepal:* Batwasi—; *Philippines:* Leteran, Pahampac—; *Sikkim:* Batwasi, Toungcheoungmourik—; *Telugu:* Penkitige—; *Uriya:* Khanta—.

VITACEAE.

Small trees or erect or climbing shrubs, the latter usually tendril-bearing, stems and branches nodose. Leaves alternate, simple lobed digitate or pedate, sometimes pinnate or bipinnate; petiole usually thickened at the articulate base; stipules 2. Flowers regular, hermaphrodite or unisexual, in panicled umbelled or spicate cymes usually opposite the leaves, peduncles often transformed into tendrils or tendril-bearing. Calyx small, entire or 4-5- toothed or -lobed. Petals 4-5, valvate, free or connate, caducous. Disk free or connate with the petals stamens or ovary, annular or expanded. Stamens 4-5, opposite the petals, inserted at the base of the disk or between its lobes; filaments subulate; anthers free or connate, 2-celled, introrse. Ovary usually sunk in the disk, 2-6-celled; ovules 1-2 in each cell, ascending, anatropous; style short; stigma small, capitate or slightly lobed. Fruit an indehiscent 1-6-seeded berry, often watery. Seeds erect, often rugulose; albumen cartilaginous sometimes ruminate;

embryo basal; cotyledons ovate or cordate; radicle short, inferior. — Genera 11. Species 450. — Mostly tropical and subtropical.

1. Shrubs, usually scandent and cirrhose. Stamens distinct, free. Ovary 2-celled .... VITIS.
2. Erect shrubs, ecirrhose. Stamens connate with the disk. Ovary 3-6-celled .... LEEA.

They are chiefly cooling and bechic.

The following have been obtained from the Order:—(1) alcohols —inositol—; (2) acids—citric, erucic, malic, palmitic, racemic, salicylic, stearic, tartaric—; (3) salts—calcium tartrate, potassium acid tartrate—.

OFFICIAL:—*Vitis vinifera* Linn. (Portugal).

VITIS Linn.

Shrubs usually cirrhose, sarmentose, often climbing to a great height, very rarely erect. Leaves simple or compound (very rarely 2-pinnate). Flowers small, sometimes polygamous, umbellate, cymose, paniculate, racemose or spicate; peduncles leaf-opposed (very rarely axillary), usually towards the ends of the branches. Calyx short, entire or 4-5- toothed or -lobed. Petals 4-5, free or calyptrately cohering at the apex. Disk various or obsolete. Stamens 4-5, inserted below the margin of the disk; anthers free. Ovary 2-celled (sometimes imperfectly), very rarely 3-4-celled; ovules 2 in each cell; style 0 or short. Berry ovoid or globose, 1-2-celled; cells 1-2-seeded. — Species 40. — N. hemisphere.

A. Leaves simple
  I. Flowers 4-merous
    a. Leaves quite glabrous
      1. Stems terete or obscurely angled
        Leaves pale green
          *Stems woody below .... 12. *V. pallida.*
          **Stems weak, trailing .... 11. *V. repens.*
      2. Stems and branches acutely angled or winged .... 1. *V. quadrangularis*
    b. Leaves pubescent or tomentose beneath
      Leaves with orange-red pubescence beneath. Flowers orange-yellow .... 2. *V. adnata.*
  II. Flowers 5-merous. Peduncles ceriferous
    a. Leaves 3-5-lobed, floccose on both sides. Flowers scarlet .... 10. *V. tomentosa.*

b. Leaves ovate, glabrous above. Flowers greenish purple .... 5. *V. indica.*
c. Leaves 3-7-lobed, at length glabrous. Flowers reddish brown .... 3. *V. latifolia.*
d. Leaves much as in *latifolia* but often tomentose ..... 4. *V. vinifera.*

B. Leaves trifoliolate
I. Flowers 4 merous
a. Berries scarlet, hispid, 1-seeded. Leaflets quite sessile .... 6. *V. setosa.*
b. Berry black, smooth, 2-4-seeded. Leaflets stalked .... 7. *V. carnosa.*
II. Flowers 5-merous .... 8. *V. araneosa.*

C. Leaves usually pedate
Flowers bisexual. Leaves 7-11-foliolate. Stems pubescent or hairy .... 9. *V. pedata.*

The genus is cooling, antiseptic, diuretic, and laxative.

The following are used medicinally in Europe—*V. vinifera* Linn.—; in China—*V. coignetiae* Pull., *V. flexuosa* Thunb., *V. japonica* Thunb., *V. labrusca* Linn., *V. serianiaefolia* Max., *V. vinifera* Linn.—; in Malaya—*V. serianiaefolia* Max.—; in Indo China *V. indica* W. and Arn., *V. trifolia* Linn.—; in the Philippine Islands —*V. capriolata* Don., *V. carnosa* Wall., *V. geniculata* Miq., *V. latifolia* Roxb., *V. quadrangularis* Wall., *V. repens* W. & A.—; in Hausa—*V. cornifolia* Bak.—; in East Africa—*V. quadrangularis* Wall.—; in North America—*V. labrusca* Linn.—.

OFFICIAL:—*V. vinifera* Linn., raisins and wine (Portugal).

1. **Vitis quadrangularis** Wall, Cat. (1828), 5992; Wight Ic. t. 51.—*Cissus edulis* Dalz. in Hook. Kew Journ. Bot. IX (1857) 248.—*C. quadrangularis* Linn. Mant. (1767) 39.—PLATE 246.

Stems leafless when old, very long, fleshy, glabrous, much contracted at the nodes, quadrangular, the angles of the young branches winged; tendrils long, slender, simple. Leaves 2.5-5 cm. long, broadly ovate or reniform, sometimes 3-7-lobed, denticulate, glabrous, cordate, rounded, truncate or cuneate at the base; petioles 6-12 mm. long; stipules small, broadly ovate, obtuse. Flowers in shortly peduncled cymes with spreading umbellate branches. Calyx cup-shaped, truncate or very obscurely lobed. Petals 4, ovate-oblong, acute 3 mm. long, hooded at the apex. Disk erect, 4-lobed. Style short, stout. Berry obovoid or globose, scarcely 6 mm. long, apiculate, red when ripe, 1- (very rarely 2-) seeded.

Distribution: Throughout India and Ceylon.—Malay Archipelago, E. Africa.

The stem is hot, dry, sweetish, bitter; laxative, anthelmintic, digestible, aphrodisiac, stomachic, tonic, analgesic; removes "vata" and "kapha", piles, blindness, epileptic fits, tumours, loss of appetite, and constipation; cures eye diseases, chronic ulcers; good for the spleen; beneficial in fractures of the bones, and in ascites; causes biliousness (Ayurveda).

The stem is bitter; it is given internally and applied topically for broken bones; used in complaints of the back and spine; removes pus (Yunani).

The leaves and young shoots are powerful alteratives; dried and powdered they are administered in certain bowel affections connected with indigestion.

The juice of the stem is useful in scurvy and in irregular menstruation. It is given in otorrhœa and in epistaxis.

The stem beaten into a paste is given in asthma; boiled in lime water it forms a preserve useful as a stomachic.

The Rongas of East Africa apply the pounded stem to wounds.

Bengal: Har, Harbhanga, Hasjora, Horjora—; *Bombay:* Harjora, Harsankar, Kandavel, Nallar—; *Burma:* Shazan-lese—; *Canarese:* Mangaravalli, Mangaroli, Sanduballi—; *Cochin China:* Di xanh voung—; *Dankalo:* Surruga—; *Deccan:* Naller—; *English:* Adamant Creeper, Bone-setter, Edible-stemmed Vine—; *Gujarat:* Chodhari, Harsankar, Taradhari, Vedhari—; *Hindi:* Hadasarihari, Hadjora, Harjora, Harsankari, Kandavel, Nallar—; *Kano:* Dadori, Dodoriya, Tsatsararkura—; *Malayalam:* Piranta, Sannalampiranta—; *Marathi:* Chaudhari, Kandavela, Tridhari—; *Mundari:* Harajora, Harajuri, Harjora, Harkankan, Harkankannari—; *Persian:* Har—; *Porebunder:* Hadsankal, Hadsankali, Hadsankar—; *Sadani:* Hadjora—; *Sanskrit:* Amara, Asthisamhara, Asthisandana, Asthisanharaka, Asthisanhari, Asthishrinkala, Asthisrimkhala, Granthiman, Kandalata, Kroshtughantika, Kulisha, Shiralaka, Vajrakanda, Vajrangi, Vajravalli—; *Sinhalese:* Hiressa—; *Sokoto:* Dadori, Dodoriya, Tsatsararkura—; *Tagalog:* Dugdung-ahas—; *Tamil:* Arugani, Indiravalli, Kiritti, Kirutti,

Pirandai, Purandai, Uchiradam, Uttanasanjivi, Vachiravalli—; *Telugu:* Nalleru, Vajravalli—; *Tigré:* Schaleh—; *Tigrinia:* Al'ah, Ammae—; *Tulu:* Sanduburu—; *Urdu:* Harjora—; *Uriya:* Hadobanda, Hadojoda, Harbhanga—; *Visayan:* Sugpon-sugpon—.

2. **Vitis adnata** Wall. Cat. (1828) 5998. — *Cissus adnata* Roxb. Fl. Ind. ed. Carey I (1824) 423; Wight Ic. t. 144.—Plate 247.

Scandent; stems and inflorescence clothed with orange-red pubescence, at length glabrate; tendrils forked. Leaves 7.5-12.5 by 5-9 cm., broadly ovate, abruptly and shortly acuminate or cuspidate, bristle-serrate, densely clothed with orange-red pubescence beneath, pubescent (at length glabrate) above; main nerves 4-5 pairs, prominent beneath; petioles 2.5-7.5 cm. long, pubescent; stipules suborbicular, hairy, caducous. Flowers greenish yellow, in much-branched peduncled compound unbellate cymes; buds oblong; fruiting pedicels more or less recurved. Calyx truncate or obscurely lobed. Petals 4, sometimes cohering at the apex and calyptrately deciduous. Berry 6 mm. diam., obovoid or subglobose, glabrous, apiculate, 1- (rarely 2-) seeded, black when ripe. Seeds with angular pits on the surface.

Distribution: Throughout India and Ceylon; S.-E. Asia to New Guinea.

The dried tuber is used by the country people as an alterative, in the form of a decoction; they consider that it purifies the blood, acts as a diuretic, and renders the secretions healthy.

The root, powdered and heated, is applied to cuts and fractures by the Santals.

Bombay: Kolezan—; *Lepcha:* Kungchenrik—; *Marathi:* Nadena—; *Nepal:* Charchare—; *Paharia:* Panilara—; *Santal:* Bodlarnari—; *Telugu:* Gudamatige, Kokkitayaralu—.

3. **Vitis latifolia** Roxb. Hort. Beng. (1814) 18. — *Ampelocissus latifolia* Planch. in Journ. Vigne Amer. (Dec. 1884) 374 et in DC. Monogr. Phan. V, pt. 2, 370.—Plate 248.

A climber with annual stems 3-6 m. long and 7.5-12 mm. diam. which are scarcely woody. Bark smooth, green, often tinged purple especially at the nodes, covered with a thin glaucous bloom. Young shoots glabrous or nearly so, hollow. Tendrils forked. Leaves

simple, 12.5-25 cm. broad, orbicular, 3-7 -angled or -lobed, sometimes lobed half way down, crenate-serrulate or dentate, cordate mealy when very young, glabrescent or with pubescent nerves when mature, often tinged with pink or purple beneath, base 5-7-nerved. Petiole varying in length up to 20 cm., deeply grooved above. Flowers 2.5 mm. diam., dark red, 5-merous, in pyramidal panicled pubescent cymes borne on a very stout peduncle together with a forked tendril. Petals not cohering at the apex, recurved, glabrous on both surfaces. Stamens bright yellow. Fruit 7.5-9 mm. diam., globose, black, succulent.

Distribution: Sub-Himalayan tract from the Sutlej eastwards to Kumaon up to 4,000 ft., Assam, Sylhet, Konkan, W. Ghats from Bombay to the Nilgiris and Anamalais, Deccan, Carnatic, N. Circars.

The roots are applied to wounds.

Ajmere: Musalmurie—; *Bengal:* Govila—; *Burma:* Chin-douk-nway-zouk—; *English:* Jungle Angoor, Jungle Grape Vine—; *Gujarat:* Junglidrakh—; *Hindi:* Panibel—; *Malayalam:* Karantavalli, Valiya-pirappitikha—; *Marathi:* Golinda—; *Merwara:* Musal, Panibel—; *Mundari:* Iotorongnari, Otorongnari—; *Porebunder:* Junglidrakh—; *Santal:* Icer, Icewer—; *Tagalog:* Bica—; *Tamil:* Kattukkodimundi-rigai—; *Telugu:* Bedasativva—; *Uriya:* Dibori, Kanjianoi—; *Visayan:* Bica—.

4. **Vitis vinifera** Linn. Sp. Pl. (1753) 202.—Plate 249A.

A large deciduous climber, tendrils long, bifid. Leaves 7.5-15 cm. long, orbicular-cordate, more or less deeply (3-) 5- lobed, margin irregularly and coarsely toothed, glabrous or nearly so above, clothed beneath with deciduous grey tomentum, thin, membranous; petiole 3.8-7.5 cm. long. Inflorescence leaf-opposed of panicled cymes; peduncle sometimes bearing an unbranched tendril below the flowers. Flowers green. Petals 5, cohering at the apex. Disk reduced to 5 hypogynous glands adnate to the base of the ovary. Style very short, thick. Berry very variable in size, bluish black or greenish. Seeds 2-4, pear-shaped, with a discoidal tubercle on the back from which a low ridge runs over the top and down the ventral face.

Distribution: A native of W. Asia.—Cultivated in many parts of India especially in N.-W. India.

There are five kinds of fruit.—The ripe fruit is acrid; cooling, laxative and purgative, fattening, diuretic, aphrodisiac, appetiser; good for the eyes, and the throat; cures thirst, fever, asthma, "vata" and "vatarakta", jaundice, strangury, burning, bad effects of drinking, blood diseases; allays vomiting; difficult to digest, causes gases in the stomach; causes "kapha".— The sour fruit causes biliousness.— The black fruit is aphrodisiac; cures "kapha" and biliousness (Ayurveda).

The leaves are useful in piles. Their juice cures headache, syphilis, piles, inflammation of the spleen; diuretic; allays vomiting, stops bleeding from the mouth; applied in scabies; produces alopecia. — The ashes of the stem are good for pains in the joints, stones in the bladder, swelling of the testicle, and piles.—The flower is expectorant, emmenagogue; enriches the blood; tonic to the liver; good in chronic bronchitis; produces constipation.—The fruit is sour, sweet; digestive, stomachic, expectorant; purifies and enriches the blood; good for lungs, liver, and kidney; fattens the body; useful in old fevers; recommended to weak people. The skin of the fruit should not be eaten.— The seeds are cooling, aphrodisiac, astringent to the bowels; their ash is applied to diminish inflammation (Yunani).

The dried fruits are demulcent, laxative, sweet, cooling, agreeable and useful in thirst, heat of body, cough, hoarseness and consumption.

The sap of the young branches is a popular remedy for skin diseases, and is still a popular remedy in Europe for ophthalmia.

The juice of the unripe grapes is used as an astringent in affections of the throat.

Black raisins in combination with other drugs are prescribed for the treatment of snake-bite (Sushruta, Vagbhata) and scorpion-sting (Sushruta).

The leaves, on account of their astringency, are sometimes used in diarrhœa.

In modern native practice, the raisins are considered cool and aperient, and given in coughs, catarrh and jaundice.

Raisins are not an antidote to snake venom (Mhaskar and Caius) or to scorpion venom (Caius and Mhaskar).

Afghanistan: Tak—; *Arabic:* Aenaeb, Anab—; *Armenian:* Otrik—; *Bengal:* Angurphal, Drakhyaluta—; *Baluchistan:* Angur, Drakh, Monaangur, Puinaangur—; *Bombay:* Abai, Drakh—; *Burma:* Sabisi, Sabyit, Sapyih—; *Canarese:* Angura, Draksha, Drakshe—; *Catalan:* Parra, Sep—; *Central Provinces:* Angur—; *Chinese:* P'u T'ao—; *Czech:* Kmen winny—; *Danish:* Wuntraee—; *Dutch:* Wijngaard—; *English:* Common Grape Vine, Vine—; *French:* Vigne, Vigne cultivéé, Vigne de Noë—; *Georgian:* Wasi—; *German:* Weinrebe, Weinstock—; *Greek:* Ampelos—; *Gujarat:* Darakh, Drakasha—; *Hebrew:* Ghephen—; *Hindi:* Angur, Dakh, Drakh—; *Hova:* Voaloboka—; *Hungarian:* Szollo—; *Italian:* Vite—; *Kalmuk:* Sur medun—; *Konkani:* Dhaku—; *Ladakh:* Basho—; *Madras:* Trachei—; *Malayalam:* Gostani, Madhurasam, Mridvika, Muntiri, Muntirika, Muntirinna, Saruphala, Svadvi—; *Malta:* Grape-vine, Vine, Vite, Dielja, Dielja tal Gheneb—; *Marathi:* Draksha—; *Mundari:* Anggurnari, Dakhnari—; *North-Western Provinces:* Angur, Dakh—; *Palestine:* Karm—; *Persian:* Angur—; *Polish:* Winna macica—; *Portuguese:* Videira—; *Punjab:* Angur, Buri, Dakh, Dakki, Dehla, Gandeli, Laning, Mamre, Nevale, Talordack, Tanaur—; *Pushtu:* Kwar—; *Roumanian:* Vita—; *Russian:* Winograd—; *Sanskrit:* Amrutaphala, Charuphala, Draksha, Gostani, Guchhaphala, Harahura, Krishna, Madhurasa, Mridvika, Phatotama, Priyala, Rasa, Rasala, Suphala, Svadi, Svadvi, Swaduphala, Tapasapriya, Yakshmaghni—; *Sind:* Drak—; *Sinhalese:* Muddrap, Uvus, Velmidi—; *Spanish:* Parra, Vid—; *Swedish:* Vinstock—; *Tamil:* Kodimundirigai, Gostanidraksha, Kottani, Kottanigai, Maduram, Madurasam, Mundirigai, Simudai, Tiracham—; *Telugu:* Draksha, Gostanidraksha, Kisumini—; *Urdu:* Angur—; *Uriya:* Drakya, Gostoni, Mridvika, Onguro, Saruphola—.

5. **Vitis indica** W. & Arn. 131; Laws. in Hook. f. Fl. Brit. Ind. I (1875) 653 (non Linn.). — *Ampelocissus arnottiana* Planch. in DC. Monogr. Phan. V, pt. 2, 379.—PLATE 250.

Scandent; stems stout, hollow, cylindric, more or less floccose-

woolly, striate; tendrils simple, 15 cm. long or more, floccose-woolly. Leaves 10-23 by 7.5-20 cm., broadly ovate, deeply cordate with a narrow sinus and rounded lobes, acute or acuminate, coarsely glandular-dentate, glabrous at length above, rufous- or grey- tomentose on the nerves beneath; nerves 6-8 pairs, prominent beneath, the two lower pairs much branched on the lower side; petioles 7.5 cm. long, densely floccose-woolly. Flowers 5-merous, greenish purple, almost hidden in a reddish woolly tomentum, nearly sessile, in dense clusters on the thick branches of a racemose or paniculate cyme 5-7.5 cm. long; buds oblong-obovoid, flattened at the top; peduncles 5-18 cm. long, usually bearing a simple tendril below the cyme. Calyx small, truncate. Petals oblong, 2 mm. long. Ovary grooved; stigma foveolate. Berry 2 cm. long, ovoid-oblong, smooth, purple.

Distribution: Konkan, N. Kanara, W. coast and W. Ghats from S. Kanara to Tinnevelly up to 3,000 ft. in Wynaad.

The juice of the root, with the kernel of the cocoanut, is employed as a depurative and aperient. In the Konkan, the countryfolk use it as an alterative in the form of a decoction, and they consider it to purify the blood and act as a diuretic and render the secretions healthy.

In Cambodia, the roots are considered pectoral and diuretic; they are used in bronchitis and gonorrhœa.

Bengal: Amdhauka, Amoluka—; *Burma:* Yen-doung—; *Canarese:* Narale, Narande, Sambaraballi—; *Deccan:* Jangli angur—; *English:* Country Angoor, Indian Grape Vine, Indian Wild Vine—; *Hindi:* Jangli angur—; *Konkan:* Palkanda—; *Malayalam:* Semparavalli—; *Marathi:* Kolejan, Nardel, Randraksha—; *Sinhalese:* Ratabulatvel, Tovel—; *Tamil:* Sambaravalli—; *Telugu:* Sambaravalli—; *Uriya:* Jondamari—.

6. **Vitis setosa** Wall. Cat. (1828) 6009; Wight Ic. t. 170.—*Cissus setosa* Roxb. Fl. Ind. I, 410.—Plate 251.

Whole plant clothed with scattered glandular bristly hairs; stem herbaceous, prostrate, weak, succulent, striate and sulcate; tendrils leaf-opposed, forked, long. Leaves succulent, sessile 3-foliolate (the lower sometimes simple); leaflets subfleshy, 5-7.5 by 3.8-5 cm.,

shortly petioluled (the petiolule of the terminal leaflet the longest), elliptic or obovate-oblong, obtuse, irregularly bristle-toothed or laciniate, glabrous or nearly so above, glandular-hispid on the nerves beneath, pale green; stipules broadly ovate, acute. Flowers 2 mm. long, contracted in the middle, arranged in leaf-opposed or apparently terminal dichotomous or trichotomous lax divaricate glandular cymes; peduncles 3.8-7.5 cm. long, glandular-hispid; pedicels short. Calyx cup-shaped, subtruncate. Petals hooded at the apex, ultimately reflexed. Style subulate. Berry 6.5-8 mm. diam., ovoid, glandular-hispid, scarlet.

Distribution: Deccan, Carnatic, slopes of the W. Ghats of the Madras Presidency, Ceylon.

The leaves are a useful local stimulant and are much used as a poultice to promote suppuration. They are also applied externally to assist in the extraction of the guinea-worm.

Canarese: Talavaranaballi—; *Ceylon:* Anaittadichchal—; *Deccan:* Yekgisamkabachla—; *English:* Hairy Wild Vine—; *Hindi:* Harmal—; *Marathi:* Khajgolichavel—; *Tamil:* Kauri, Pulinaralai, Pulippirandai, Sangugelari, Sugambal—; *Telugu:* Barrebachali, Pullabachali—; *Uriya:* Ambilidonkonoi—.

7. **Vitis carnosa** Wall. Cat. 6018; Wight Ic. t. 171; Laws. in Hook. f. Fl. Brit. Ind. I, 654 (excl. *Cissus auriculata* Roxb.).—*V. trifolia* Cke. I, 254 (non Linn.).—*Cayratia carnosa* Gagnep. in Lecomte Not. Syst. I (1911) 358.—PLATE 252.

Scandent; stems herbaceous or woody at the base only, compressed, densely pubescent when young; tendrils short, slender, usually branched. Leaves 3-foliolate; common petioles 2-4.5 cm. long; leaflets thick, 3.8-5.7 by 2.2-3.2 cm. (the middle one the largest), rotund-ovate, ovate-lanceolate or obovate, acute or obtuse, crenate-serrate or subinciso-dentate, more or less pubescent on both surfaces; main nerves 5-6 pairs; petiolules of the lateral leaflets 3-6 mm. long, those of the terminal leaflets twice as long; stipules small, ovate, acute. Flowers in branched divaricate pubescent long-peduncled cymes; buds globose; pedicels about 3 mm. long. Calyx pubescent outside, funnel-shaped, truncate or obscurely 4-lobed.

Petals 4, oblong, rounded at the apex, 2.5 mm. long, hooded, pubescent outside. Disk cup-shaped with a plicate margin. Style conical. Berry turbinate, fleshy, 1.2-2 cm. long, 2-4-seeded. Seeds triangular, rounded and rugose on the back, cuneate on the face.

Distribution: Throughout India and Ceylon, Malay Peninsula.—Java.

The root has a sharp sour taste; cures "vata" and "kapha", tumours, pains, and spleen complaints (Ayurveda).

The root is sour with a sharp taste; purifies the blood and lessens biliousness; good for liver and heart troubles, and for inflammation of the spleen; tonic, stomachic; produces cough (Yunani).

The names given to it in many parts of India denote one of its most general uses, *viz.*, the treatment of yoke sores on the necks of bullocks. For that purpose, a poultice of the leaves is employed (Elliot).

According to Irvine the seeds and also leaves are employed as an embrocation.

Stewart remarks that the root, ground with black pepper, is applied to boils.

The root is used as an astringent medicine.

Assam: Maimati, Marmarati—; *Bengal:* Amallata, Bundal—; *Bombay:* Odi—; *Canarese:* Heggoli—; *English:* Fleshy Wild Vine, Fox Grape—; *Gujarat:* Khat, Khatumdu, Tamanya—; *Hindi:* Amalbel, Gidardrak, Kassar, Ramchana—; *Las Bela:* Naugil—; *Lepcha:* Takblirik—; *Malayalam:* Sorivalli—; *Marathi:* Amlatbel, Kadamadavalli, Odi—; *Nepal:* Jarilalahara—; *Paharia:* Jarilalara—; *Pampangan:* Ayu, Culutpamo—; *Patna:* Sonekesur—; *Porebunder:* Khatkhatunkho—; *Punjab:* Amalbel, Drukri, Gidardak, Karik, Vallur—; *Sanskrit:* Aranyavasini, Atyamlaparni, Ballisurana, Banastha, Kandura, Karavadavalli, Tikshna—; *Sinhalese:* Valratdiyalabu—; *Tagalog:* Calitcalit, Cavilan, Pacopod—; *Telugu:* Kadepatige, Kamputige, Kaniyapatige, Kurudinne, Mandulamaritige, Mekamettani, Pulimada—; *Urdu:* Amalabel—; *Uriya:* Molobhanganoi—; *Visayan:* Alangingi, Caguindi, Lagini, Langingi, Lupo—.

8. **Vitis araneosa** Laws. in Hook. f. Fl. Brit. Ind. I (1875) 657.—*Ampelocissus araneosa* Planch.—PLATE 249B.

Scandent, the whole plant covered with floccose down which is deciduous except on the underside of the leaves; tendrils forked. Leaves 3-foliolate, ultimately glabrous above, clothed beneath with persistent floccose down, the common petiole 2.5-5.7 cm. long; terminal leaflets 7.5-10 by 3.8-5 cm., elliptic or lanceolate, acute, crenate-serrate, attenuated or rounded and nearly equilateral at the base, on petiolules about 1.2-2 cm. long; lateral leaflets scarcely smaller, very inequilateral at the base (the lower side much the larger and rounded, the upper side smaller and acute), on petiolules about half as long as those of the terminal leaflets. Flowers 5-merous, in leaf-opposed small umbellate cymes; peduncles reaching 7.5 cm. long, bearing a forked tendril below the cyme; pedicels very short. Calyx small, membranous, 5-lobed or truncate. Petals 5, oblong, rounded at the apex, 2 mm. long. Ovary ribbed at the apex; style short, stout; stigma foveolate. Berry globose, size of a pea, 1-4-seeded. Seeds ellipsoid, 6 by 4 mm., rugose, pointed at one end, longitudinally grooved on the back and with a deep circular depression on the face.

Distribution: Deccan, higher Ghats W. of Junar, W. Ghats in the Nilgiris, Pulneys and Anamalais, Sheveroy Hills of Salem, up to 4,500 ft.

The tuberous, starchy, astringent roots, sliced and dried, are sold by the Konkan herbalists, under the name of Chamar-musli.

Bombay: Bendervel, Bendri, Ghorvel—.

9. **Vitis pedata** Vahl ex Wall. (1828) 6027.—*Columella pedata* Lour. Fl. Cochinch. (1790) 85.—*Cissus pedata* Lam. Encyc. I (1783) 31.—*Cayratia pedata* Gagnep. in Lecomte Not. Systs. I (1911) 346.—PLATE 253.

Scandent, softly pubescent, sometimes hairy, rarely glabrate; tendrils long, slender, forked. Leaves 7-11-foliolate, the lateral leaflets pedately arranged; common petioles 5-7.5 cm. long, hairy or glabrate; leaflets 5-12.5 by 2.5-6.3 cm., oblong-lanceolate, acuminate, serrate, pubescent or glabrous, often oblique at the base; petiolules variable in length, those of the terminal leaflets usually much longer than those of the lateral ones. Flowers bisexual, white, in axillary

divaricate shortly pedunculate corymbose cymes. Calyx shallow, 4-lobed; lobes triangular. Petals 4 (rarely 5), triangular, calyptrately deciduous, cohering at the apex. Disk large, cup-shaped, exceeding the ovary. Berry about the size of a pea, subglobose or often 4-lobed, 2-4-seeded, cream-coloured when ripe. Seeds hemispheric, smooth, with a deep circular pit closed by a thin membrane on the flat lower face.

Distribution: Throughout India and Ceylon; Malaya.

Sometimes used as a substitute for *V. setosa.*

This plant is used as a domestic medicine, because of its astringency.

Bengal: Goalilata—; *Lepcha:* Tungrutrikup—; *Malayalam:* Tripadi, Veluttasorivalli—; *Marathi:* Gorpadvel—; *Sanskrit:* Godhapadi, Suvaha—; *Sinhalese:* Mediyavel—; *Tamil:* Kattuppirandai, Naralai—; *Telugu:* Edakulamandulamari, Gummaditige, Kaniyapatige, Kaniyamu, Nasagummadi, Pulimada, Tigegummadi—; *Uriya:* Pittapotalo—.

10. **Vitis tomentosa** Heyne in Roth Nov. Pl. Sp. (1821) 157.

Scandent; stems stout, covered with a dense reddish or white detergible tomentum; tendrils long, forked, woody. Leaves 10-20 cm. long, as broad as, or sometimes broader than long, palmately 3-5- angled, -lobed or -partite, closely serrate-dentate, floccose with whitish cobwebby wool, base cordate with a wide sinus, less commonly truncate; petioles 3.8-7.5 cm. long; stipules short, truncate. Flowers 5-merous, scarlet, small, sessile, in shortly peduncled compact densely woolly cymes 2.5-5 cm. long, at the ends of stiff leaf-opposed peduncles; peduncles bearing a long 1-3-forked tendril below the cyme; buds broadly oblong, truncate, araneously wooly. Calyx thin, membranous, woolly outside, covering over the petals in bud, 5-lobed; lobes short, triangular. Petals 5, ovate-oblong, not cohering at the apex, glabrous. Ovary conical, 10-furrowed at the apex; style 0; stigma foveolate. Berry subglobose, 8 mm. diam., 2-3-seeded. Seeds ovoid-oblong, coarsely and irregularly rugose.

Distribution: W. Peninsula of India, Ceylon.

With the Santals the root is deemed useful to allay swellings.

Mundari: Datrombili, Iotrong—; *Santal:* Ghoralidi—; *Tamil:* Sirunaralai—; *Telugu:* Atukulabaddu, Garigummadi, Lolugatige, Puvvuyettagummadi—; *Uriya:* Katobhangonoi—.

11. **Vitis repens** Wight & Arn. Prodr. (1834) 125.—*Cissus cordata* Roxb. Fl. Ind. I (1832) 407.

Scandent, quite glabrous; branches subterete when fresh, angled when dry; young shoots glaucous; tendrils weak, leaf-opposed, forked. Leaves membranous, pale green, 7.5-15 by 2.5-9 cm., broadly ovate, acuminate, glabrous, the margins undulate and distinctly spinous-toothed, base deeply cordate; main nerves about 4 pairs, the lower pair branching outwards; petioles 2.5-5.7 cm. long; stipules rounded. Flowers in compound umbellate cymes; buds conical; peduncles leaf-opposed, solitary or rarely fascicled, 2.5-6.3 cm. long; pedicels slender. Calyx membranous, truncate. Petals 4, triangular-ovate, subacute, 2.5 mm. long, free. Berry subglobose or pyriform, 3-4 mm. diam., usually 1-seeded.

Distribution: E. tropical Himalaya, Assam, Chittagong, W. Peninsula.—Java, Amboyna.

The plant is applied to sloughing and foetid ulcerations, also to boils and small abscesses as a maturant.

Canarese: Elakombullaballi—; *Lepcha:* Kungchenrik—; *Malay:* Akar lakom bulan—; *Malayalam:* Mrigampuli—; *Nepal:* Pureni—; *Pampangan:* Pirapitangin—; *Saora:* Ladayikottam—; *Telugu:* Nelaboddu—; *Uriya:* Diboria—.

12. **Vitis pallida** W. & A. Prodr. (1834) 125.—*Cissus pallida* planch. in DC. Monogr. Phaner. V, pt. 2, 477.

A climbing shrub; stems woody below, terete or nearly so; tendrils simple. Leaves 7.5-15 cm. diam., pale green, cordate (with a wide sinus), ovate or orbicular, shortly acuminate, glabrous, the margins with shallow distant glandular incurved serratures; petioles 5-12.5 cm. long; stipules membranous, broadly oblong, obtuse, caducous. Flowers in compound umbellate cymes; peduncle 2.5-5 cm. long, thick and fleshy. Calyx saucer-shaped, the margins membranous. Petals 4, calyptrately deciduous but free at the apex,

triangular-ovate. Style rather long, slender. Disk 4-lobed. Berry 1- (rarely 2-) seeded, size of a pea, pyriform or subglobose, mucronate, supported on an incurved pedicel.

Distribution: E. & W. Peninsulas.

The plant is used in rheumatism.

Canarese: Kondage, Mandakumbale, Marde—; *Telugu:* Nallatige, Peddagummadi—; *Uriya:* Takuanoi—.

LEEA Royen ex Linn.

Small trees, shrubs or herbs; branches striate or furrowed, the pith often very large; no tendrils. Leaves alternate, usually large, simple or 1-2-3-pinnate; petiole dilated at the base into sheathing stipules. Flowers small, red yellow white or greenish, in leaf-opposed or subterminal peduncled corymbose cymes. Calyx cup-shaped or funnel-shaped, 5-lobed. Petals 5, connate at the base and adhering to the staminal tube, afterwards revolute, induplicate-valvate, hooded at apex and connate in bud. Disk or staminal tube cylindric with 5 lobes, connate at the base with the ovary, furnished within with a dependant toothed membranous fold; lobes entire or more or less prominently notched, sometimes apiculate. Stamens 5, the filaments inserted between the lobes of the disk, inflexed; anthers attached by their middles within the tube, introrse, free or connate at their margins in bud, dehiscing longitudinally; connective thick, oblong. Ovary inserted on the base of the disk, 3-6-celled; style short; stigma scarcely thickened; ovule 1 in each cell. Fruit a 3-6-celled, usually succulent, depressed-globular, lobed, berry with 3-6 seeds attached to the centre. Seeds wedge-shaped with a hard external and membranous inner testa, the latter deeply protruded in about 6 folds into the albumen; embryo basal with small ovate cotyledons, radicle long.—Species 60.—Palæotropics.

A. Leaves simple .... 1. *L. macrophylla.*
B. Leaves usually simply pinnate
    Stems with crisp wings .... 2. *L. crispa.*
C. Leaves 2-3-pinnate
    I. Leaves glabrous .... 3. *L. indica.*

II. Leaves hairy beneath
  a. Lobes of staminal tube entire .... 4. *L. robusta.*
  b. Lobes of staminal tube notched
    Leaves with scattered glandular disks beneath .... 5. *L.* aequata.

The genus has demulcent, emollient, and astringent properties.

The following are used medicinally in Indo China—*L. rubra* Blume—; in the Philippine Islands—*L. indica* Merrill, *L. rubra* Blume—; in Java—*L. indica* Merrill—; in the Gold Coast and in Madagascar—*L. guineensis* G. Don.—.

1. **Leea macrophylla** Roxb. ex Hornem. Hort. Hafn. I (1813) 231; Laws. in Hook. f. Fl. Brit. Ind. I, 664 (partim, excl. *L. latifolia*); Wight Ic. t. 1154.—PLATE 254.

Herbaceous, erect, 30-90 cm. high; root tuberous, perennial, red. Leaves simple, broadly ovate, cordate, acute or acuminate, coarsely serrate or sublobed, nearly as broad as long, the lower leaves up to 60 cm., the upper 15-23 cm. long, dark green and glabrous above, cano-pubescent beneath; main nerves opposite, 8-10 pairs, very prominent; petioles 5-12.5 cm. long, deeply striate, glabrous. Flowers white, in terminal much-branched puberulous corymbose cymes often 30 cm. long; buds oblong; peduncles deeply grooved; pedicels short. Calyx divided about $^1/_3$ of the way down; lobes triangular-ovate, tipped with a small hard point. Petals oblong. Staminal tube deeply divided; lobes oblong, entire or emarginate; anthers laterally united in bud. Berry 6-8 cm. diam., black, 3-6-celled, depressed-globose, usually 3-6-lobed.

Distribution: Throughout the hotter parts of India, Assam, Burma, Siam, Laos.

The root is a good alexipharmac (Ayurveda).

The tuberous root is employed in the cure of guinea-worm, and when pounded is applied to obstinate sores to promote cicatrization. According to Roxburgh, the root is astringent and a reputed remedy for ringworm.

In Chota Nagpur it is applied externally to allay pain. The Burmans apply it to wounds to stop the effusion of blood.

Bengal: Dholsamudra—; *Bombay:* Dinda—; *Burma:* Kya-bet-gyi, Kyah-phet-kyi—; *Hindi:* Dholsamudra, Samudraka—;

Lepcha: Dampamtomkung—; *Marathi:* Dinda—; *Nepal:* Balyettra—; *Sanskrit:* Dholasamudrika, Samudraka—; *Santal:* Hatkan—.

2. **Leea crispa** Linn. Mant. I (1767) 124.—PLATE 255.

An erect shrub, 1.2-2.4 m. high; stems somewhat woody, jointed, swollen above the joints, and together with the branches, peduncles, and petioles, furnished with 6-8 short crisp wings. Leaves usually simply pinnate (the lower pair of leaflets rarely with one (or both?) of the pair compound); leaflets oblong, very parallel-sided, 10-18 by 3.8-7.5 cm., acute or shortly acuminate, sharply serrate, glabrous above, pubescent on the nerves and veins beneath, usually rounded at the base; main nerves 12-20 pairs, prominent, parallel, nearly straight, one running into each serrature; veins transverse, nearly parallel, close, conspicuous beneath; petiolules of the lateral leaflets 3-12 mm. long, those of the terminal much longer. Flowers greenish white, in small terminal slightly pubescent cymes; bracts subpersistent, linear-subulate, 6-8 mm. long; bracteoles 3 mm. long, lanceolate. Calyx shortly divided; lobes triangular, gland-tipped. Petals oblong. Lobes of the staminal tube linear-oblong, bifid; anthers not united in bud. Style grooved. Berry 8 mm. diam., depressed-globular, usually 2-6- (or more-) lobed, black when ripe.

Distribution: Konkan, N. Kanara, W. Ghats in the Nilgiris and Malabar, W. tropical Himalaya, Oudh.

The tubers are used as a remedy for guinea-worm.

The leaves when bruised are applied to wounds in Bengal.

Bengal: Banchalita—; *Burma:* Kaletthein, Kaphettheing—; *Malayalam:* Nalugu, Nellu—; *Uriya:* Hatikanopotro—.

3. **Leea indica** Merrill in Philipp. Journ. Sc. Bot. XIV (1914) 245.—*L. sambucina* Willd. Sp. Pl. I. (1797) 1177.—*Aquilicia sambucina* Linn. Mant. II (1771) 211.—*Staphylea indica* Burm. f. Fl. Ind. (1768) 75, t. 23, fig. 2.—*Leea staphylea* Roxb. Hort. Beng. 18; Wight Ic. t. 78.—PLATE 256 (under *L. sambucina* Willd.).

A shrub 1.2-3 m. high; branches numerous, straight, tough, the young ones green, glabrous. Leaves 38-50 cm. long, 2- (rarely 3-) pinnate; leaflets 7.5-20 by 3.8-9 cm., oblong or elliptic-oblong, acuminate, coarsely and irregularly serrate, glabrous, base acute or

cuneate; main nerves 7-12 pairs, prominent beneath, arched; petiolules of the lateral leaflets 6-10 mm. long, those of the terminal much longer. Flowers white, in large branched corymbose cymes; bracts inconspicuous, caducous. Calyx shortly divided; lobes subacute or rounded and with membranous margins. Lobes of the staminal tube rounded at the apex, notched; anthers united in bud. Berry 6-8 mm., depressed-globular, often 2-6-lobed, smooth, shining, purple-black.

Distribution: Throughout India and Ceylon, Malay Peninsula, Andamans.—Indo-China, Philippines.

According to Rheede, a decoction of the root is given in colic, and it is cooling and relieves thirst.

In Goa, the root, called ratanhia by the Portuguese, is much used in diarrhœa and chronic dysentery. The roasted leaves are applied to the head in vertigo. The juice of the young leaves is a digestive. In La Reunion, the root is called *Bois de Sureau*, and is said to be used as a sudorific.

Bengal: Kurkur jihwa—; *Burma:* Kalet, Naga-mouk—; *Canarese:* Andilu—; *Goa:* Dino—; *Hindi:* Kurkur jihwa—; *Java:* Soelangkar—; *La Reunion:* Bois de source, Bois de sureau—; *Malayalam:* Manipiranta, Nellu—; *Marathi:* Dino, Karkani—; *Portuguese:* Ratanhia—; *Sanskrit:* Karkatajihva, Kukurajihva—; *Sinhalese:* Burulagass—; *Tagalog:* Caliangtang—; *Tamil:* Nalava, Niyakku, Ottannalam—; *Telugu:* Ankadora Jatamukkudu—; *Uriya:* Bonotulasi—; *Visayan:* Amamale, Mamale—.

4. **Leea robusta** Roxb. Hort. Beng. (1814) 18.—*L. diffusa* Laws. in Hook. f. Fl. Brit. Ind. I, 667.—PLATE 257.

A shrub 1.5-1.8 m. high; young branches rusty-pubescent. Leaves simply pinnate to tripinnate; rhachis and petioles angled, not winged; leaflets 7.5-23 by 2.5-9.5 cm. (the terminal leaflets very much larger than the lateral ones, acute at the base while the lateral leaflets are rounded), oblong or elliptic-oblong, acuminate, irregularly serrate, sparsely strigose above, pubescent and with the nerves sparsely

strigose beneath; main nerves 8-12 pairs, ascending; petiolules of the terminal leaflets often reaching 5 cm., those of the lateral leaflets 3-13 mm. long. Flowers greenish white in long-peduncled much-branched compound cymes; bracts caducous. Calyx divided about 1/3 of the way down. Lobes of the staminal tube rounded or truncate, not bifid at apex; anthers slightly united in bud. Berry 6 mm., depressed-globular, black when ripe; pyrenes 6-4.

Distribution: Konkan, N. Kanara, W. Ghats in Malabar and W. Nilgiris up to 3,000 ft. E. Ghats, hills of N. Circars to the Godavari up to 3,000 ft., Nepal, Khasia Hills, Andamans, Malay Peninsula, Siam.

In Chota Nagpur the soft and fleshy root is applied externally as an anodyne, and is also given to cattle for diarrhœa.

Goa: Gino—; *Hasada:* Huamdaru—; *Lepcha:* Pantom—; *Naguri:* Huram—; *Nepal:* Galeni—; *Santal:* Haramada, Hatkan—; *Telugu:* Peddapayagillaku—; *Uriya:* Nunonunia—.

5. **Leea aequata** Linn. Mant. I (1767) 124.—*L. hirta* Roxb. Fl. Ind. I (1832) 655.—PLATE 258 (under *L. hirta* Roxb.).

A shrub 1.2-3 m. high; young shoots more or less pubescent. Leaves 2-pinnate (the upper often simply pinnate or rarely simple); rhachis angled but hardly winged, pubescent; petioles not dilated at the base; leaflets 7.5-18 by 2.5-4.5 cm., oblong or ovate-oblong, acuminate, irregularly serrate, more or less hairy on both surfaces, covered beneath with numerous flat circular disks; main nerves 7-12 pairs, ascending, curved; petioles of the lateral leaflets 3-6 mm., those of the terminal reaching 2.5 cm. long. Flowers white, very shortly pedicelled, in short compact pubescent cymes; bracts large, broadly ovate, obtuse, caducous. Calyx pubescent and sparsely covered with glandular disks outside, cleft about 1/4 the way down; lobes ovate, subacute. Lobes of the staminal tube oblong, bifid; anthers united in bud. Berry 6 mm. diam., depressed-globular, usually 2-6-lobed, black when ripe.

Distribution: Sikkim Himalaya, Assam, East Bengal, Sylhet, Burma, Andamans, Malay Peninsula.—Sumatra, Java.

The root is bitter, acrid, hot, pungent; anthelmintic, vulnerary, antipyretic, alexiteric; useful in bronchitis, anaesthesia of skin,

dyspepsia, bilious fevers, leprosy, itching, and tuberculous ulcers (Ayurveda).

The tubers and stems are astringent and mucilaginous.

Bengal: Kakjangha—; *Burma:* Nagamauk—; *Canarese:* Jirichilecha—; *Gujarat:* Aghedi—; *Hindi:* Kakajangha, Kakjangha, Masi—; *Malayalam:* Kakanasika—; *Marathi:* Kanga—; *Sanskrit:* Dasi, Dhvankshajangha, Kaka, Kakajangha, Kakakala, Kakanasa, Kakanasika, Kakanchi, Kakanga, Kakangi, Kakavha, Kaki, Krishibala, Nadikanta, Paravatapadi, Sulomasha, Surangi, Surapadi—; *Telugu:* Surapadi, Velanasandi—.

SAPINDACEAE.

Trees or shrubs, rarely climbing herbs. Leaves alternate (rarely opposite), generally compound; stipules caducous or 0. Flowers usually polygamo-dioecious, often irregular. Calyx usually 4-5-lobed or 4-5-sepalous; lobes or sepals often unequal, imbricate or rarely valvate. Petals 4-5 or 0, free, equal or unequal, often bearded or squamate at the base within. Disk annular or unilateral, rarely wanting in the male flowers. Stamens 5-10 (usually 8), inserted inside the disk at the base of the ovary, or outside, or on the disk, sometimes unilateral; filaments often pubescent, usually free; anthers 2-celled, basifixed or versatile. Ovary centric or excentric, entire, lobed or partite nearly to the base, 1-4-celled; ovule 1 (rarely 2 or more) in each cell, affixed to the axis of the ovary, ascending; style simple or divided, usually terminal; stigma usually simple. Fruit capsular or indehiscent, entire or lobed, sometimes winged. Seeds globose or compressed, arillate or naked, usually exalbuminous; embryo usually thick, sometimes plicate or spirally convolute.—Genera 120. Species 1,000.—Tropical and subtropical region.

A. Stamens inserted inside the disk, sometimes unilateral. Leaves exstipulate, alternate or, in *Aesculus*, opposite

I. Flowers irregular
  a. Ovule solitary. Leaves alternate, not digitate
    1. Fruit capsular, inflated, globose or pyriform. Leaflets biternate .... CARDIOSPERMUM.
    2. Fruit deeply divided into 3-1 indehiscent lobes Leaves 3- or 1- foliolate. Flowers very small .... ALLOPHYLUS.
  b. Ovules 2 together. Leaves opposite, digitate .... AESCULUS.
II. Flowers regular
  a. Fruit not deeply lobed
    Calyx small; lobes valvate or slightly imbricate Petals absent. Fruit ovoid .... SCHLEICHERA.
  b. Fruit deeply divided into 3-1 lobes
    1. Sepals widely imbricated Fruit smooth .... SAFINDUS.
    2. Calyx valvate or slightly imbricated Flowers usually panicled and not fascicled. Fruit muricated or tubercled or obsoletely so .... NEPHELIUM.
    3. Calyx cup-shaped, 4-5-toothed. Flowers in terminal panicles. Fruit indehiscent. Pericarp sharply tuberculate containing one large obovoid brown seed enclosed in a fleshy opalescent aril .... LITCHI.

B. Flowers regular. Stamens inserted on the disk. Leaves opposite, exstipulate
  Ovary 2-celled, ovules 2 together. Fruit consisting of a double samara .... ACER.

C. Flowers regular. Stamens inserted outside the dick. Leaves alternate, exstipulate .... DODONAEA.

Bitter, tonic, and astringent; also acrid, narcotic, and poisonous.

The following substances have been isolated:—(1) acids-acetic, arachic, butyric, capsulaesic, n-eicosanic, hydrocyanic, lauric, leucine, lignoceric, oleic, palmitic, stearic—; (2) ureides—allantoin—; (3) purines—caffeine, guanine, hypoxanthine—; (4) phosphatides—lecithin—; (5) glucosides—aesculin, fraxin, quercitrin, saporubin—.

OFFICIAL:—*Aesculus Hippocastanum* Linn. (Belgium, France) =*Hippocastanum vulgare* Gaertn. (Portugal).

Paullinia Cupana Kunth (Switzerland)=*P. sorbilis* Martius (Hungary); *P. sorbilis* Mart. (Austria, Portugal).

Schleichera trijuga Willd. (Holland).

CARDIOSPERMUM Linn.

Climbing tendril-bearing herbs with wiry stems. Leaves alternate, exstipulate, 2-ternate; leaflets coarsely crenate or serrate. Flowers irregular, polygamo-dioecious, in axillary racemes or

corymbs, the common peduncle 2-cirrhose. Sepals 4, much imbricate, the 2 exterior small. Petals 4, arranged in pairs, the 2 upper furnished with a large scale below the base of each, the 2 lower smaller, distant, each furnished with a small crested scale. Disk unilateral, undulate, of 2 glands opposite the lower petals. Stamens 8, excentric; filaments unequal, free or connate at the base. Ovary sessile or subsessile, 3-celled; ovule solitary, ascending; style short, 3-fid. Capsule membranous, trigonous, 3-celled, 3-valved, inflated, loculicidal. Seeds globose, usually arillate at the base; testa crustaceous; cotyledons large, transversely conduplicate.—Species 15. —Tropical, chiefly American.

C. halicacabum Linn. is used medicinally in Indo China, Guinea, Togoland, South Africa, La Reunion, Madagascar.

1. **Cardiospermum halicacabum** Linn. Sp. Pl. (1753) 366. —PLATE 259.

Annual and perennial; branches slender, striate, pubescent or glabrous. Leaves deltoid, 2-ternate, petioles 2-3.8 cm. long; ultimate segments of the leaves lanceolate, glabrous or sparsely pubescent, inciso-serrate, very acute at the apex and narrowed at the base. Flowers white, 3-4 mm. long, in few-flowered umbellate cymes; peduncles slender, stiff, axillary, 3.8-10 cm. long, provided beneath the cyme with 2 opposite usually circinate tendrils; pedicels very slender, 3-12 mm. long. Outer sepals rounded, obovate, usually with a few scattered hairs on the back just below the apical margin; inner sepals larger than the outer, rounded, mebranous. Petals rounded at the apex. Style very short. Capsules shortly stalked, subglobose or more commonly depressed-pyriform, trigonous, truncate at top, winged at the angles, bladdery, veined. Seeds globose, 4-6 mm. diam., smooth, black, with a small white heart-shaped aril.

Distribution: Most warm countries.

The root is considered diaphoretic, diuretic, and aperient. It is mucilaginous, and imparts this property to water, rendering it nauseous, and is thus administered in fevers. On the Malabar Coast the leaves are administered in pulmonic complaints. According to Ainslie, the leaves mixed with castor oil, are employed internally in

rheumatism and lumbago. The fried leaves are considered emmenagogue.

The whole plant rubbed up with water is applied to rheumatism and stiffness of the limbs. The leaves, mixed with jaggery, and boiled in oil, are a good specific in sore-eyes.

The whole plant, steeped in milk, is successfully applied to reduce swellings and hardened tumours.

In the Punjab, the seed is used as a tonic in fever, and a diaphoretic in rheumatism.

The juice of the plant promotes the catamenial flow during the menstrual period. It is also a demulcent in gonorrhœa and in pulmonary affection. It is dropped into the ears to cure earache, and discharge from the meatus.

The plant is prescribed in snake-bite (Charaka, Sushruta). The root is given in scorpion-sting (Charaka, Vagbhata).

In Ceylon the expressed juice or an aqueous extract of the fresh leaves is given internally in cases of snake-bite (Roberts).

In Indo China the plant is considered anthelmintic and anti-blennorrhagic. In the West Indies the leaves are used as a stimulant and diuretic.

In parts of Togoland the leaves are applied to cuts and injuries.

The Zulus use the plant for a variety of purposes. An infusion of the leaf and stalk is given as an anema for dysenteries and diarrhœas. The pungent vapour from the crushed leaf is inhaled to relieve headache. In bladder troubles, a poultice of the leaf and other plants is applied over the bladder, after anointing the skin. This leaf paste is also applied to syphilitic sores. For a general outbreak of sores over the body, an infusion of the leaf is drunk.

In Madagascar the root is used as an emetic and aperient, and is said to be also diaphoretic and diuretic. The roots and leaves are given in the treatment of bleeding piles, amenorrhœa, gonorrhœa, rheumatism, erysipelas, and intestinal worms.

The decoction was given in the out-patient department to cases of chronic rheumatism with negative result (Koman).

The root, stem, and leaves have no antidotal value against snake-venom. The plant is useless as an errhine in the treatment of snake-

bite (Mhaskar and Caius). The root is not an antidote to scorpion-venom (Caius and Mhaskar).

Annam: Cay bong bong, Ta, bop leo—; *Arabic:* Habbulkalkal, Taftaf—; *Bengal:* Lataphatkari, Nayaphatki, Noaphutki, Sibjhul—; *Bombay:* Bodha, Kauphuti, Naphat, Shibjal—; *Burma:* Malamai—; *Canarese:* Agniballi, Bekkinatoddinaballi, Erumballi, Kakaralata, Kangu, Kangunge, Minijuballi—; *Ceylon:* Mudakottam—; *English:* Balloon Vine, Black Liquorice, Blister Creeper, Heart Pea, Heart Seed, Palsycurer, Pigeon's Knee, Winter Cherry—; *Fanti:* Esungan—; *French:* Cardiosperme, coeur des Indes, Corinde, Pois de coeur, Pois de merveille—; *Gujerati:* Karolio—; *Hausa:* Garafunin fadama, Garafunin Kwata, Gautan Kwado, Godar zomo—; *Indo China:* Phong thuyen kat, Tam phong—; *Krobo:* Okpoku lairnosi—; *La Reunion:* Pocpoc liane, Pois merveille—; *Madagascar:* Masontsokina, Vahintsokina—; *Malay:* Peria bulan, Uban Kayu—; *Malayalam:* Jyotishmati, Katabhi, Lata, Paluruvam, Ulinna—; *Marathi:* Kanphuti, Kapalaphodi—; *New Caledonia:* Mor ko ton—; *Pampangan:* Paltugpaltucan—; *Philippines:* Barcolon—; *Porebunder:* Kagdolio—; *Sanskrit:* Jyotishmati, Jyotir, Karavi, Karnasphota, Nagna, Paravatanghi, Sakralata—; *Sinhalese:* Painairavel, Penelvel—; *South Africa:* Balloon Vine—; *Tagalog:* Bangcolon—; *Tamil:* Kottavan, Mudakattan, Mudakottan, Periyayilaimudakottan, Samuttiram, Samuttiradoyan, Siliyanai, Soliyan, Sugattan, Tiragamulagam—; *Telugu:* Buddakakara, Ekkudutige, Jyotishmatitige, Kasaritige, Nallagolisyandu, Patalitivva, Ullenatige, Upparinta—; *Tulu:* Urundeburu—; *Twi:* Totoku, Tortor—; *Visayan:* Cana—; *Zulu:* iKambileziduli, uZiphu—.

AESCULUS Linn.

Trees and shrubs with scaly buds. Leaves opposite, digitate, deciduous, exstipulate; leaflets obovate or oblong, serrate. Panicles terminal, thyrsoid. Flowers large, polygamous, irregular. Calyx tubular or campanulate, 5- cleft or -dentate, deciduous, with unequal imbricated lobes. Petals 4-5, unequal, clawed, without scales, imbricated, exceeding the calyx. Disk annular or unilateral, lobed or

entire. Stamens 5-8, usually 7, inserted within the disk, free. Ovary sessile, 3-celled. Style elongated, slender; stigma simple. Ovules 2 in each cell of the ovary, superposed. Fruit capsular, 1-3-celled; valves loculicidal, coriaceous; cells 1-seeded. Seeds subglobose, exalbuminous, with a broad hilum; testa coriaceous; cotyledons thick, corrugated, conferruminated. — Species 25. — N. temperate region, S. America.

1. Leaflets 5-9, oblong-lanceolate or oblong-oblanceolate, acuminate 1. *A. indica.*
2. Leaflets 5-7, cuneate-obovate, acuminate .... 2. *A. hippocastanum.*

The bark is bitter and astringent. The seeds are often poisonous.

The following are used medicinally in Europe —*A. hippocastanum* Linn.—; in Indo China — *A. turbinata* Blume—; in China — *A. chinensis* Bge.—; in North America — *A. glabra* Willd., *A. hippocastanum* Linn., *A. pavia* Linn.—.

Official:—The bark and seeds of *Ae. Hippocastanum* Linn. =*Hippocastanum vulgare* Gaertn. (Portugal); the fresh seed of *Ae. Hippocastanum* Linn. (Belgium, France).

1. **Aesculus indica** Colebr. in Wall. Cat. (1828) n. 1188. — *Pavia indica* Wall.; Jacquem. Voy. Bot. t. 35.—Plate 261.

A large deciduous tree, bark peeling off upwards in narrow strips, young shoots minutely pubescent or tomentose. Leaves opposite, digitate, exstipulate; petiole 10-15 cm. long. Leaflets 5-9, 15-25 by 5-9 cm., the outer smaller, oblong-lanceolate or oblong-oblanceolate, acuminate, sharply serrate, glabrous, narrowed at the base; petiolules 5-25 mm. long. Flowers 2.5 cm. long, irregular, in numerous, small, pubescent cymes arranged in terminal, erect, narrow-pyramidal panicles 30-38 cm. long. Calyx 5-7.5 mm. long, tubular, shortly 5-lobed, splitting when the flower expands, often so as to appear 2-lipped, densely clothed with short, grey tomentum. Petals 4, clawed, tomentose outside, white and yellow, base often streaked with red, 2 petals narrower than the others. Disk unilateral, anterior, lobed. Stamens 7, inserted within the disk at the base of the ovary, filaments exceeding the petals. Ovary tomentose, narrow-oblong, 3-celled; ovules 2 in each cell; style simple, as long as the stamens. Fruit a capsule, 2.5-5 cm. long, ovoid, not echinate,

containing 1-3 seeds. Seeds 2.5 cm. or more in diam., dark brown, shining.

Distribution: Trans-Indus in Kafiristan, 7,000—8,000 ft., N.-W. Himalaya, 4,000—9,000 ft., Indus to Nepal, chiefly in moist and shady valleys.

The fruit is used for horses in colic. It is also applied externally in rheumatism; for this purpose the oil is generally extracted from the seeds.

Hindi: Bankhor, Gugu, Kanor, Pankar—; *Jaunsar:* Bankhor, Kandar, Kandur, Pangar—; *Kashmir:* Hane, Hanudun, Kakra—; *Kumaon:* Kishing, Pangar—; *Kunawar:* Pu—; *Punjab:* Bankhor Khanor—; *Trans-Indus:* Torjaga—.

2. **Aesculus hippocastanum** Linn. Sp. Pl. (1753) 344.—PLATE 260.

Large tree, 18-24 m. Leaflets 5-7, sessile, cuneate-obovate, acuminate, obtusely serrate, nearly glabrous. Panicles 20-30 cm. long, very showy; flowers white, tinged with red, 2 cm. long. Fruit echinate.

Distribution: Europe.—Cultivated in some parts of India.

The fruit and bark have long been regarded as useful in the treatment of fevers as an anti-periodic.

In France and Germany the bark is held in estimation for cutting short attacks of intermittent fever and ague. The nuts are used in cases of piles and of obstinate constipation; they are particularly indicated when the bottom of the back gives out on walking, with aching and a sense of weariness in that region. Likewise, signal relief is found to be wrought by the nuts when the throat is duskily red and dry, in conjunction with costiveness and piles. A tincture is made from the ripe nuts with spirit of wine, or the nuts themselves are finely powdered and given in that form.

An extract of the leaves has proved of service in whooping-cough.

The glucoside aesculin, isolated from the bark, is said to be a good febrifuge. Glaser and Kraus (1925) claim to have synthesized it.

The medicinal properties of this plant have been discovered

and made public especially by physicians and chemists of the homœopathic school.

Allantoin has been isolated from the shoots.

Danish: Hestekastagnetrae—; *Dutch:* Paardenkastanjeboom, Wildekastanjeboom—; *English:* Horse Chestnut—; *French:* Bois de Spa, Chataignier d'Inde, Marronnier d'Inde—; *German:* Rosskastanienbaum—; *Italian:* Castagno d'India, Ippocastano—; *Polish:* Konski, Kasztan—; *Portuguese:* Castanheiro da India—; *Punjab:* Pu—; *Roumanian:* Castan—; *Russian:* Dikie Kashtan, Konskoi Kashtan—; *Saintonge:* Morrongnié—; *Spanish:* Castano de Indias—; *Swedish:* Haestekastagnien—.

ALLOPHYLUS Linn.

Shrubs or small trees, ecirrhose. Leaves alternate, exstipulate, 1-3-foliolate; leaflets usually large, entire or serrate. Racemes simple or laxly paniculate, axillary. Flowers irregular, small polygamo-dioecious. Sepals 4, in opposite pairs, cucullate, membranous, widely imbricate, the 2 outer smaller. Petals 4 (the place of the 5th vacant), usually small, naked inside or with a shaggy scale above the claw. Disk unilateral, lobed or swollen into 4 glands opposite the petals, very rarely obsolete. Stamens excentric or scarcely centric, included or shortly exserted. Ovary usually 2-celled; ovule 1 in each cell, ascending from its base. Fruit indehiscent, usually 1-2-lobed; lobes subglobose, fleshy or dry. Seeds erect, usually with a very short fleshy aril; embryo curved; cotyledons plicate. — Species 120. — Tropics and subtropics.

Astringent root.

The following species are used medicinally in Indo China— *A. glabra* Radlk.—; in the Philippine Islands — *A. cobbe* Blume —; in the Gold Coast — *A. warneckei* Gilg., *A. zeylanicus* Linn. —.

1. **Allophylus serratus** Radlk. in Rec. Bot. Surv. Ind. III, 341. — *A. Cobbe* Blume Rumph. III (1847) 131.

A small tree, or a shrub often climbing to a considerable height. Leaves 3-foliolate, 7.5-14 by 4.5-7 cm., alternate, crowded at the extremities of the branchlets, drooping; common petioles 5-6.3 cm.

long, ferrugineo-pubescent; leaflets ovate or elliptic, acute or acuminate, sharply and distantly serrate-dentate, more or less hairy or pubescent on both surfaces, the terminal leaflet usually acute at the base, the lateral leaflets usually rounded and more or less oblique; petiolules of the lateral leaflets 6-8 mm., those of the terminal leaflets sometimes reaching 2.5 cm. long. Flowers small, white, shortly pedicelled, in fascicles along the branches of spicate axillary 2-4-branched racemes. Sepals glabrous. Petals cuneate, with a fringed scale above the claw. Stamens 8. Ovary 2-lobed, hairy. Fruit globose, smooth, size of a pea, red when ripe.

Distribution: Assam, Sylhet, Burma, E. and W. Peninsula, Ceylon.—Malaya, N. Australia.

The astringent root is employed in parts of India to check diarrhœa (Balfour; Cyclop. of India).

Burma: Thaukjot—; *Canarese:* Sisidale—; *Malayalam:* Mukkanamperu —; *Marathi:* Tipani —; *New Caledonia:* Ementele—; *Saora:* Korra—; *Tamil:* Amalai—; *Telugu:* Eravalu, Guvvaguti, Juttika, Paladondativva, Sallikunkudu, Savitibukka, Tangutam, Tantisa, Tavatiki—; *Uriya:* Khondokoli, Kokodakoli, Soloniya—; *Visayan:* Balic—.

SCHLEICHERA Willd.

Trees. Leaves alternate, paripinnate, exstipulate. Flowers regular, polygamo-dioecious, small, fascicled in slender racemes or panicles. Calyx small, cupular; lobes 4-6. Petals 0. Disk flat, undulate on the margin. Stamens 5-8, inserted within the disk. Ovary ovoid, narrowed to the rigid style, 3-celled; stigma 3-4-lobed; ovules solitary. Fruit dry, crustaceous, indehiscent. Seeds with a fleshy aril.—Species 2.—Tropical Asia and the Philippines.

S. trijuga Willd. is used medicinally in Indo China. The oil from the seeds is official in Holland.

1. **Schleichera trijuga** Willd. Sp. Pl. IV (1805) 1096. — PLATE 262.

A small or medium sized deciduous or subdeciduous tree up to 2.7 m. girth and 18 m. high, with short bole and dense spreading

crown, the base of the stem often irregularly fluted. Bark pale brown, fairly smooth, thinly mealy-corky outside, exfoliating in irregular woody scales. Blaze 1-1.5 cm., hard, not fibrous, pinkish, stippled with pale orange sclerotic tissue. Leaves 20-40 cm. long. Leaflets 2-4 pairs, the lowest pair usually about one-third the size of the terminal, the terminal 10-23 by 3.8-10 cm., elliptic, entire, glabrous, apex usually rounded, subsessile. Flowers greenish yellow, fascicled in spike-like lateral racemes 7.5-12.5 cm. long, simple or often panicled in the male, appearing with the new foliage which is coloured a fresh green or deep red. Fruit 2.5-3.8 cm. long, ovoid, 1-2-seeded. Seeds 1.5 cm. long, smooth, compressed, brown.

Distribution: Sub-Himalayan tract from the Sutlej to Nepal, Chota Nagpur, Central India and the Peninsula generally, Ceylon, throughout Burma, not found in Assam so far.

The bark cures leprosy, skin diseases, inflammation, ulcers, and "kapha".— The unripe fruit is sour, heating to the body, heavy to digest; causes biliousness; destroys "vata"; astringent to the bowels. — The ripe fruit is sweet, sour; digestible, astringent to the bowels, heating; increases taste and appetite; cures "kapha" and "vata".— The seeds are oily and tasty, increase appetite; tonic; cure biliousness. The oil is bitter, sour, sweetish; tonic, stomachic, anthelmintic, purgative; cures skin diseases, heals ulcers (Ayurveda).

The bark is astringent. Rubbed up with oil it is used as a cure for itch. The Santals apply it externally to relieve pains in the back and the loins.

The oil is used for the cure of itch and acne.

The oil of the seeds proves a very efficient and stimulating agent for the scalp, both cleansing it and promoting the growth of hair.

In the Nilgiris the oil is used for anointing the body. The medicinal effects are variously reported as purgative (in the United Provinces) and as prophylactic against cholera (in Thana division, Bombay). It is more usual to apply it externally in massage for rheumatism (Bombay), for the cure of headache (Sambalpur, Central Provinces). Its application in Bombay, Malabar, and Coorg, is said to be effective in removing itch and other forms of skin diseases, and this remedy is known to the wild forest tribes. The powdered seeds are applied to ulcers of animals and for removing maggots.

In Combodia the bark is prescribed in malaria as a maceration or infusion. It is also applied to swollen glands and ripening boils.

The inflorescence is recommended for the treatment of snake-bite (Sushruta, Bapat); but it is not an antidote to snake-venom (Mhaskar and Caius).

The seeds and their oil have been the subject of much study.

Bombay: Assumar, Gosam, Kocham, Kosam, Kosamb, Koshimb, Peduman—; *Burma:* Gyo, Kobin, Kyet-mouk, *Canarese:* Hulimaya, Kakuta, Paparti, Sagade, Shargadi—; *Central Provinces:* Kobja, Kussum—; *Ceylon:* Kula, Puvu—; *Coorg:* Chendala, Sandala—; *English:* Ceylon Oak, Gum Lac Tree, Honey Tree—; *Gond:* Komur, Pusku—; *Gujarat:* Kossame—; *Hindi:* Gausam, Kosum, Kusum—; *Indo China:* Dau truong, Dok phen, Kho som, Pongro—; *Kadir:* Nityavanji, Puvam, Puvatti, Sana, Sottilai—; *Kolami:* Baru—; *Konkani:* Kassimb, Kossombo—; *Kumaon:* Kusm—; *Kurku:* Baru—; *Lambadi:* Hulimairo—; *Malayalam:* Puvam—; *Marathi:* Kohan, Kosimb, Kusumb, Peduman—; *Mundari:* Baru, Barudaru—; *North-West Provinces:* Gosam—; *Panch Mahals:* Kassuma, Kocham, Koham—; *Portuguese:* Carvalho de Ceylao—; *Punjab:* Gausam, Jamoa, Kussumb, Summa—; *Sanskrit:* Ghanaskandha, Jantupadapa, Koshamra, Krimivriksha, Kshudramra, Lakshavriksha, Raktamra, Sukoshaka, Suraktaka, Vanamra—; *Santal:* Baru—; *Saora:* Kosengi—; *Sinhalese:* Kon, Kong, Konghas—; *Tamil:* Kolama, Konji, Konjivanji, Kumbadiri, Mirugakkottai, Mudgottan, Pulichai, Pu, Puvam, Sakkattai—; *Telugu:* Busi, Kodalipulusu, Madakapulusu, Mavitavitiki, Mayiratanga, Paparti, Posuku, Pullakaya, Pulusuramarajati, Pulisari, Sagadeposuku—; *Tulu:* Sakate—; *Uriya:* Kusumo—.

SAPINDUS Linn.

Trees or shrubs. Leaves alternate, paripinnate; leaflets entire; stipules 0. Flowers regular, polygamous, in panicles. Sepals 5, unequal, in 2 series, much imbricate. Petals 4-5. Disk annular, lobed. Stamens usually 8, inserted within the disk; filaments free.

Ovary entire or 2-4-lobed, 2-4-celled; stigma 2-4-lobed; ovule solitary. Fruit fleshy or coriaceous, of 1-3 indehiscent drupes; drupes with fibrous pericarp, brittle when dry. Seeds with a very hard outer integument.—Species 20.—Tropical and subtropical regions, except Africa and Australia.

1. Ovary hairy .... 1. *S. trifoliata.*
2. Ovary glabrous. Anthers short .... 2. *S. mukorossi.*

The fruits are detersive and very acrid.

The following species are used medicinally in China, Indo China and the Malay Peninsula—*S. mukorossi* Gaertn.—; in South America—*S. divaricatus* Willd., *S. saponaria* Linn.—; in French Guiana—*S. arborescens* Aubl., *S. frutescens* Aubl., *S. rigidus* Mill., *S. saponaria* Linn.—; in Guinea—*S. senegalensis* Poir.—.

The toxic glucoside "saporubin" is contained in *S. saponaria* Linn. and *S. trifoliata* Linn.

1. **Sapindus trifoliata** Linn. Sp. Pl. (1753) 367.—*S. laurifolia* Vahl Symb. III (1794) 54.—PLATE 263.

A handsome tree. Leaves abruptly pinnate; leaflets subopposite, 2-3 pairs, 7.5-18 by 2.5-10 cm., lanceolate or elliptic-lanceolate, acute or acuminate, entire, glabrous above, more or less pubescent beneath, base acute; main nerves about 8-12 pairs; petioles 3 mm. long, pubescent. Flowers dingy white, in terminal rusty-pubescent panicles, the males numerous, the bisexual flowers few. Sepals 5, rotund-ovate, ciliolate, fulvous-pubescent outside, glabrous within, 4 mm. long. Petals 4-5, shortly clawed, narrower than the sepals, lanceolate, villous outside and more or less so within, usually furnished with 2 villous scales attached at each side of the petal about half way up. Disk concave with a fleshy hirsute margin. Stamens 8; filaments villous; anthers oblong, apiculate. Ovary densely hairy. Fruit fleshy, 2- (usually 3-) lobed, clothed with fulvous hairs when young, glabrous and wrinkled when ripe, with 1 seed in each lobe. Seeds blackish, smooth, about the size of a large pea, very hard.

Distribution: Indian Peninsula, chiefly in S. India, much cultivated.

The fruit is sharp, hot, heavy; digestible, emetic, abortifacient, alexipharmac; cures "tridosha"; sedative to the uterus (Ayurveda).

The root is expectorant; used as a collyrium in sore eyes and ophthalmia.—The fruit has a bitter bad taste; tonic, stomachic, alexeteric, aphrodisiac; useful in chronic dysentery, diarrhœa, cholera, hemicrania, tubercular glands, paralysis, of the limbs, lumbago, epileptic fits of children; allays uterine pain; fumigation good in melancholy.—The seed is sweetish; used locally to stimulate the uterus in childbirth and to increase menstruation (Yunani).

The fruit is considered tonic and alexipharmac.

It is given internally as an emetic, nauseant, and expectorant. As an errhine it is used as a remedy in hemicrania, asthma, hysteria, and epilepsy. Externally it is detergent, and is given for the stings and bites of poisonous insects.

In snake-bite the fruit is ground with water and used as a collyrium (Nighantaratnakara). The nut and the leaf are recommended in combination with other drugs and enter into the composition of a large number of prescriptions (Bapat).

In cases of scorpion-sting the fruit is ground to a pulp and given internally, while the smoke from the burning nut is being inhaled (Subodhavaidyaka).

The root is said to be useful as an expectorant. Both the root and the fruit are given as an anthelmintic.

"As an emetic: nauseant and expectorant. The pricarp or pulp of soap-nut is quite equal to ipecacuanha, if not superior to it, and is very useful in all the affections in which the latter is indicated. The emetic action of soap-nut always relieves asthma to a more or less extent, and generally more speedily than ipecacuanha and *Tylophora asthmatica*. It is also useful in the same way in some classes of colic, particularly when the latter is depending on indigestion. A thick watery solution of the drug is often resorted to by the natives of this country for the relief of hemicrania, hysteria, and epilepsy. They drop a few drops of the solution in each nostril during the fit of any of the above diseases, and it produces a temporary relief by irritating the mucous membrane and increasing its secretion,

which flows out by the nostrils or the mouth or by both. I gave a trial to this plan of treatment, in my own practice, not only in the above maladies, but also in asthma, and the result was pretty favourable. There was more or less relief in almost every case of hemicrania and asthma in which the solution was tried; but the cases of hysteria and epilepsy benefited by it were very few. Although the relief afforded by the solution is always temporary, yet it is in many cases instantaneous.

"I have been using the pericarp of soap-nut in my practice for several months, and have just (August, 1887) discovered it to be the one of the best, cheapest and commonest emetics in India. While it is as safe as ipecacuanha and several other vegetable emetics, it is decidedly more speedy in its action than all those drugs. It is, however, required to be employed in a much larger dose than ipecacuanha; but this is no disadvantage, for it is always administered in the form of a draught, and this draught is less nauseous and unpleasant than that of ipecacuanha and many other emetics. As an emetic, the soap-nut well deserves to be brought into general use by the medical profession.

"Soap-nut is supposed to be a good anthelmintic in some native medical works, in four or five grain doses; but this is not really the case. I have used it in very large doses (ʒj to ʒij) in many cases, and its emetic action was sometimes accompanied by one or two loose motions. But I have neither seen nor heard of any of my patients passing a single round or any other abdominal worm on any occasion. The root of the soap-nut tree is woody, very hard and quite inert. The root-bark and bark, however, contain the vegetable principle, *saponin*, and form the froth-like soap, when bruised and agitated in water. I have used each of these drugs in decoction, and in large and repeated doses, and found them to be very mild expectorants and demulcents. As medicines, they are so weak, that I did not consider them worthy of being treated as such." (Moodeen Sheriff).

Neither the fruit nor the leaves are an antidote to snake venom. The fruit is useless as an external application in the treatment of snake-bite (Mhaskar and Caius). The fruit is equally useless in the treatment of scorpion sting (Caius and Mhaskar).

The oil from the seeds has been studied by Paranjpe and Ramaswamiayyar (*Journ. Ind. Inst. Sc.;* XII, 1929). It is a rich source of a n-eicosanic acid.

Arabic: Bandukehindi, Findukehindi, Rita—; *Bengal:* Bara rita, Ritha—; *Berar:* Ud-rack—; *Bombay:* Rhita, Ritha—; *Burma:* Meav-me-sue-khati, Miavmen-sue-khe-si—; *Canarese:* Antarale, Antavala, Arishta, Aritala, Burugukayi, Kugate, Phenilu, Runde, Talemaradu—; *Central Provinces:* Rithia—; *Deccan:* Ritha—; *English:* Soap Nut Tree of South India—; *Gujarat:* Aritha, Arithan—; *Hindi:* Ritha—; *Lambadi:* Areta—; *Malayalam:* Arishtam, Pachakkotta, Phenilam, Ponnankotta, Pulinji, Savakkaya, Urvanji—; *Marathi:* Ringin, Rita, Ritha, Rithe—; *Persian:* Bindake hindi, Ratah—; *Sanskrit:* Arishta, Arishtaka, Arthasadhana, Garbhapatana, Guchhaphala, Krishnavarna, Kumbhabijaka, Mangalya, Phenila, Pitaphena, Prakirya, Raktabija, Rishta, Somavalkala—; *Sinhalese:* Antavala, Gaspenela, Kahapenala, Punerai, Puvella, Talaimarutha—; *Tamil:* Manippungu, Nittavanji, Neykottan, Ponnangottai, Puvandi, Puchikkottai, Punalai—; *Telugu:* Kukudu, Kunkudu, Phenilamu—; *Tulu:* Nurekayi—; *Urdu:* Ritha—; *Uriya:* Muktamaya, Muktimonji, Rettia, Ritha—.

2. **Sapindus mukorossi** Gaertn. Fruct. I (1788) 342.—*S. detergens* Roxb. Hort. Beng. (1814) 29.—PLATE 264.

A small or medium sized deciduous free up to 1.8 m. girth and 15 m. high. Bark dark or pale grey, somewhat rough, exfoliating in irregular woody scales. Blaze 7.5-1.3 mm., hard, not fibrous, pale orange-brown. Leaves 23-50 cm. long. Leaflets 5-8 pairs, opposite or alternate, 9-18 by 2.5-5 cm., lanceolate, acuminate, glabrous, often slightly falcate or oblique, with 15-20 pairs or rather indistinct secondary nerves and others between. Petiolules 2.5-5 mm. long. Flowers 5 mm. diam., white or purple, subsessile, very numerous, mostly bisexual, in large terminal pubescent pyramidal panicles. Fruit of 1-3 distinct, indehiscent carpels, 1.8-2.5 cm. diam., smooth, pale brown, globose, wrinkled before falling. As a rule only one carpel develops and the undeveloped ovaries persist as excrescences at the base of the one which has developed. Seeds

solitary, 10-13 mm. diam., globose, black, loosely contained in the fleshy pericarp.

Distribution: Perhaps indigenous in the W. Himalaya from the Sutlej eastward up to 4,000 ft., Assam; much cultivated in N. India up to 5,000 ft. in the Himalaya.

The fruits are used in salivation, epilepsy, and chlorosis. They are expectorant.

The seeds pounded with water are given in epilepsy.

In Lakhimpur, Assam, a paste of the nut is used internally in fevers (Carter).

In China the bark, ground and macerated in cold water, is used to remove vermin from the hairy parts of the body. In Malaya the seeds are supposed to remove tan and freckles from the skin, and a solution of the fruits is a remedy for cutaneous diseases.

The berries contain a fairly large amount of saponin.

Assam: Haithaguti—; *Bengal:* Ritha—; *Bombay:* Kanmar, Ritha—; *Canton:* Muk Wan Che—; *Chinese:* Mu Huan Tzu, Wu Huan Tzu—; *English:* Soap Nut Tree of North India—; *Hindi:* Aritha, Dodan, Kanmar, Ritha—; *Indo China:* Bo hon, Bon hon, Vo hoan thu—; *Kumaon:* Ritha—; *Malay Peninsula:* Mook wan chee—; *North-West Provinces:* Kanmar—; *Punjab:* Dodan—; *Sanskrit:* Arishta, Phenila—; *Uriya:* Ita—.

LITCHI Sonner.

Species 1.—China.

1. **Litchi chinensis** Sonner. Voy. Ind. III (1782) 255.—*L. sinensis* J. F. Gmel. Syst. 635.—*Nephelium lit-chi* Camb. in Mém. Mus. Par. XVIII (1829) 30.—PLATE 265 (under *Nephelium lit-chi* Camb.).

An evergreen shrub or small tree. Leaves alternate, exstipulate. Leaflets 2-8, opposite or alternate, 3.8-15 by 1.2-4.3 cm., oblong-lanceolate or ovate, acuminate, shining above, glaucous beneath. Flowers about 2.5 mm. across, greenish, in terminal panicles. Calyx cup-shaped, 4-5-toothed. Petals 0. Stamens 6-10, inserted inside a fleshy, glabrous disk. Ovary 2-3-lobed, lobes 1-celled, 1-ovuled. Fruit of 1-3, ovoid, indehiscent carpels about

3.8 cm. long by 2.5 cm. diam., red when ripe (brown as usually seen), pericarp dry, thin, brittle, sharply tuberculate, containing one large obovoid brown seed enclosed in a fleshy opalescent succulent sweet edible aril.

Distribution: Indigenous in China.—Widely cultivated in India.

The fruit has a sweet smell of rose; tonic to the heart, the brain, and the liver; allays thirst; very wholesome to the body (Yunani).

The plant is used medicinally in China, Indo China, the Philippine Islands, and La Reunion.

In Indo China the almond from the kernel is ground and macerated in alcohol for use in intestinal troubles; the green fruit is prescribed to children in smallpox; the root, bark, and flower are used in the form of a decoction as a gargle for throat affections.

The seeds in the Malay Peninsula are used by the Chinese as an anodyne and are prescribed in various neuralgic disorders and in orchitis.

In China the leaves are used as a cure for the bites of animals.

Bombay: Lichi—; *Burma:* Kyetmauk—; *Chinese:* Li Chih—; *English:* Litchi—; *French:* Litchi—; *Hindi:* Litchi—; *Indo China:* Le chi, Vai—; *La Reunion:* Letchi—; *Madagascar:* Letisy, Litchy—; *Philippines:* Lechia—; *Tamil:* Ilichi—; *Tayabas:* Halopagamo—; *Urdu:* Lichur—; *Uriya:* Lishi—.

Nephelium Linn.

Trees. Leaves alternate, pinnate; leaflets entire. Panicle terminal and in terminal axils, rarely racemose. Flowers regular, small, unisexual (or bisexual). Calyx 4-5-lobed. Petals small, white, villous rarely with 2 scales, sometimes 0. Stamens 6-8 within the fleshy disk; filaments usually pubescent. Ovary pubescent, warted or setose, 1-2- (rarely 3-) lobed; lobes 1-celled, 1-ovuled. Fruit 1- or 2- coccous, drupaceous, oblong or globose, echinate or tubercled, rarely smooth. Seed ellipsoid with sweet or acid white pulpy aril.—Species 25.—Indo-Malayan.

1. Petals wanting. Calyx dentate or half-cleft .... 2. *N. lappaceum.*
2. Petals present. Calyx usually with deep divisions .... 1. *N. longana.*

Fruit stomachic.

The following species are used medicinally in China—*N. lappaceum* Linn., *N. longana* Camb.—; in Indo China and the Malay Peninsula—*N. longana* Camb.—; in the Philippine Islands—*N. glabrum* Noronh., *N. longana* Camb.—.

1. **Nephelium longana** Camb. in Mém. Mus. Par. XVIII (1829) 30.—*Euphoria Longana* Lam. Dict. III, 574; Bot. Reg. t. 1729; Bedd. Fl. Sylv. t. 156.—PLATE 266A.

A tree, 9-12 m. high; bark smooth, flaking off in small pieces; young parts clothed with rufous stellate pubescence. Leaves 10-45 cm. long, equally or unequally pinnate; rhachis rusty-puberulous when young, afterwards glabrous; leaflets 2-5 pairs, reddish when young, coriaceous, 6.3-20 by 2.5-5 cm., oblong or ovate-lanceolate, more or less oblique, shortly acuminate, glabrous and reticulately veined, base cuneate; main nerves 10-15 pairs, prominent beneath; petiolules 6-12 mm. long. Flowers small, white, in clusters on the branches of terminal and axillary large much-branched puberulous panicles; pedicels short, pubescent. Calyx 5-6-lobed; lobes obtuse, densely pubescent. Petals 5-6, linear-spathulate, pubescent, about as long as the calyx. Disk pubescent. Stamens 6-10, included in the female, exserted in the male flowers; filaments hairy at the base. Ovary 2-3-lobed; style long; stigmas 2, recurved. Fruit supported on the persistent calyx, edible when young, globose, reddish, tubercled. Seed solitary, enveloped in a fleshy pale subacid aril, black, shining.

Distribution: W. side of the Peninsula, in evergreen forest, from the Konkan southwards, Ceylon, Khasia Hills, Burma, Malay Peninsula.—S. China.

In Indo China the fruit, deprived of its kernel and dried, is used as a tonic and considered a useful brain stimulant.

In China the fruit is reputed to be nutrient, stomachic and anthelmintic.

Bengal: Asphal—; *Bombay:* Wumb, Wumbasohal—; *Burma:* Kyet-mauk, Tawthayet—; *Canarese:* Kanakentali, Malehakuta—; *Canton:* Lung Ngan—; *Ceylon:* Nurai—; *Chinese:* Lung Yen, Lung Yen Hua—; *English:* Burdock Soap Nut, Dragon's Eye, Eye-ball Tree, Longan—; *French:* Longanier, OEil de dragon—; *Indo China:*

Long nhan, Nhan—; *Kadir:* Mullai, Sembuvan—; *Malayalam:* Malapuvana, Poripuvana, Sempuvana—; *Malay Peninsula:* Long gun fa—; *Marathi:* Vomb, Wumb—; *Sinhalese:* Mora, Murale, Rasa-mora—; *Tagalog:* Alipai, Alpai, Alupag, Alupai, Lechias—; *Tamil:* Kattupuvam, Pirappin, Puvam, Sembuvam, Varattarbuvam—.

2. **Nephelium lappaceum** Linn. Mant. I, 125.

Tree, about 9-15 m. tall. Branchlets puberulous. Leaves 10-25 cm. long; leaflets 4-6, elliptic or oblong obtuse, thinly coriaceous, 6.3-15 cm. long, 3.2-7.5 cm. wide; petiolules 5 mm. long. Panicles 15 cm. long, terminal and axillary, lax, spreading. Flowers 2.5 mm. across, white, often unisexual, in cymose fascicles. Sepals 4-6. Petals 0. Stamens 5-8, exsert. Ovary 2-3-lobed, echinate. Fruit 1- or 2- lobed, ellipsoid, densely covered with long soft spines, yellow to bright red, 3.8 cm. long. 1.2 cm. through.

Distribution: Cultivated everywhere in the Malay Peninsula, often found as an escape in forests.—Malay Archipelago.

In China the fruit is considered stomachic and anthelmintic.

In Cambodia the fruit is used as an astringent and febrifuge; the decoction is prescribed in diarrhœa and fever.

Cambodia: Ser Mon—; *Chinese:* Shao Tzu—.

ACER (Tourn.) Linn.

Trees or shrubs; buds with many scales, the outer shorter, coriaceous, the inner oblong, membranous, developing later. Leaves entire, palmately lobed or pinnately 3-5-foliolate. Flowers regular, in racemes or corymbs. Calyx usually 5-lobed, the lobes imbricate, deciduous. Petals as many as the calyx-lobes or 0, erect, shortly clawed. Disk thick. Stamens usually 8, inserted on the disk. Ovary 2- rarely 3- lobed and -celled, laterally compressed; cells 2-ovuled; style bipartite. Fruit a double samara, indehiscent; wing large, membranous.—Species 150.—N. temperate regions, especially in hill districts.

Bark astringent.

The following are used medicinally in Europe—*A. campestre* Linn., *A. monspessulanum* Linn., *A. pseudo-platanus* Linn.—; in China

—*A. nikoense* Max., *A. trifidum* Thunb.—; in North America—*A. rubrum* Linn.—.

1. **Acer pictum** Thunb. Fl. Jap. 162.—PLATE 266B.

A small or medium sized deciduous tree up to 1.8 m. girth and 21 m. high, usually producing several stems or many strong adventitous shoots from near the ground, old stems irregularly fluted and knotted towards the base. Bark pale grey or silvery brown, fairly smooth, with shallow cracks. Blaze 1.2-2 cm., soft, not fibrous, pinkish brown. Young shoots glabrous with a thin glaucous film, not lenticellate. Adventitious shoots often dark green. Leaves 7.5-15 by 10-20 cm., 5-7-lobed, lobes acuminate, margins entire, base usually cordate, bearded in the axils of the nerves otherwise glabrous, glossy green on both surfaces especially beneath, base 5-7-nerved. Petiole 2.5-20 cm. long, slender, terete, pink when young. Flowers 7.5 mm. diam., greenish yellow, pentamerous, in terminal glabrous trichotomous panicles 5-10 cm. long on short leafy shoots appearing with the young leaves. Fruit glabrous; wings 2.5-3.3 cm. long, divaricate, backs curved outwards, pink when young; nuts thin, compressed.

Distribution: N.-W. Himalaya, Indus to Sarda, 4,000—9,000 ft., common in mixed forests above 7,000 ft., Bhutan.

The leaves are used to raise blisters. The bark is prescribed as an astringent.

Chamla: Mandal, Maner—; *Garhwal:* Dumitha, Gadhpapri, Gudkima, Potli—; *Hazara:* Trekhan—; *Jaunsar:* Dudh kainju, Kabusi, Kainchli, Kainju—; *Kanawar:* Tian—; *Kashmir:* Wun—; *Kumaon:* Bankima, Pata, Tikta—; *Murree:* Trikanna, Trikunda—; *North-West Provinces:* Kabasi, Kainjli, Kanchli—; *Punjab:* Jarimu, Kakru, Kanjar, Kanzal, Laur, Tarkhana, Tilpattar, Trekhan—; *Simla:* Dhadonjra—.

DODONAEA Linn.

Shrubs, rarely trees, often viscous. Leaves alternate, exstipulate, simple or abruptly pinnate. Flowers unisexual or polygamodioecious in axillary or terminal racemes, corymbs or panicles, inconspicuous.

Sepals 2-5, imbricate or valvate. Petals 0. Disk obsolete in the male, small in the female flowers. Stamens 5-10 (usually 8), inserted on the outer side of the disk; filaments very short; anthers linear-oblong, obtusely 4-gonous. Ovary sessile, 3-6-gonous, 3-6-celled; ovules 2 in each cell, collateral or superposed. Capsule membranous or coriaceous, 2-6-gonous, septicidally 2-6-valved, valves winged at the back, cells 1-2-seeded. Seeds lenticular or subglobose, compressed, exalbuminous, exarillate; funicle thickened; testa crustaceous or coriaceous; embryo spirally convolute.—Species 50.—Tropics, especially Australia.

D. viscosa Jacq. is used medicinally in Indo China, the Philippine Islands, La Reunion, South Africa, Peru; *D. thunbergiana* E. & Z. in South Africa.

1. **Dodonaea viscosa** Jacq. Enum. Pl. Carib. (1760) 19.—*Ptelea viscosa* Linn. Sp. Pl. (1753) 118.—Plate 267.

A shrub, rarely a small tree, with erect twiggy branches often angled; young parts scurfy-puberulous. Leaves subsessile, simple, more or less viscid with a yellowish resinous exudation, 3.8-10 by 0.6-3.8 cm. (the breadth very variable), oblanceolate, subacute or shortly apiculate, glabrous, shining, tapering much towards the base. Flowers greenish yellow, small, in short few-flowered axillary spreading cymes; pedicels slender, nodding. Sepals oblong, 2.5-3 mm. long, about equalling the stamens. Anthers oblong-linear, very large. Ovary pilose; style long. Capsules membranous, compressed, 1.2-2 cm. long and slightly broader, with a wide marginal wing notched at the base and apex, viscid, orange-brown. Seeds black.

Distribution: Throughout India, Ceylon, and in most warm countries.

The leaves of this shrub are viscid, and have a somewhat sour and bitter taste. Lindley says they are used in baths and fomentations.

It is believed that the powdered leaves applied over a wound will heal it without leaving a white scar. The powder is used in burns and scalds.

The leaf is said to be useful in rheumatism and to possess febrifugal properties.

In the Punjab, it is used in snake-bite. For this purpose the leaves are bruised and applied to the bitten part; juice of the leaves is also given internally.

At Koh Rach in Ormara the juice is used as a wash for swellings; at the Mula Pass it is used for a poultice (Hughes-Buller).

In South Africa the plant is used for many diseases, but particularly for stomach disorders.

In Madagascar the bitter leaves are used as a febrifuge; the wood in decoction is an astringent bath or fomentation.

In La Reunion an infusion of the leaves is used as a sudorific. A popular panacea.

In Peru the leaves are chewed, like coca leaves, as a stimulant.

The leaves are not an antidote to snake-venom, and are useless in the symptomatic treatment of snake-bite (Mhaskar and Caius).

Afrikaans: Gansies, Kankerbos—; *Badaga:* Bandare—; *Baluchistan:* Ghisanni—; *Belgaum:* Dawakajahr—; *Betsileo:* Lambinamorona—; *Bombay:* Bandari, Bandurgi, Zakumi—; *Canarese:* Bandare, Bandarike, Bundurgi, Hangaralu, Hangaru—; *Central Provinces:* Banderu, Kharata—; *Ceylon:* Virali—; *Chopi:* Tsekatseki—; *Hazara:* Sanatha—; *Hindi:* Aliar, Sonalta, Walaytinahndi—; *Hova:* Dindgadingandahy—; *Jaunchotok:* Anarthrik—; *Kadir:* Unnataruvi—; *Kakamega:* Muendu—; *Kamba:* Mutheo—; *Kangra:* Mirandu—; *Kikuyu:* Muremumusua—; *Kohlu:* Worra—; *Lambadi:* Bandediro—; *La Reunion:* Reinette—; *Lenge:* Tsekatseki—; *Madagascar:* Digadigambazaha, Dingandahy—; *Madras:* Vrali—; *Malay:* Kayu bertih, Seringan laut—; *Malayalam:* Unnataruvi, Virali—; *Marathi:* Lutchmi—; *Masai:* Ol gerturai—; *Mula Pass:* Anartrik—; *Nasirabad:* Daduni—; *New Zealand:* Ake, Akeake, Akerantangi—; *Ormara:* Hanartirk—; *Pab Hills:* Anartrik—; *Punjab:* Banmendu, Mendar, Mendru, Sanatta, Santha—; *Pushtu:* Ghoraskai, Ghuraskai, Wuraskai—; *Sakalave:* Lovinohazo—; *Saora:* Gollapulleda—; *Simla:* Pipali—; *Sinhalese:* Etaverella—; *Tagalog:* Alipata, Calapinai—; *Tamil:* Velari, Virali—; *Tasmania:* Native Birch, Native Ebony, Native Lignum vitae—; *Tayabus:* Haguyuy—; *Teita:* Misidu—; *Telugu:* Bandaru, Bandedu, Pullena—; *Tigré:* Tasses—; *Tigrinia:*

Tahsses—; *Trans-Indus:* Ghuraska, Veravena—; *Zambales:* Casirag—.

ANACARDIACEAE.

Trees or shrubs usually with oleo-resinous often acrid juice. Leaves alternate, simple or compound, exstipulate. Flowers small, regular, 1-sexual, polygamous, or 2-sexual, usually panicled. Calyx 3-5-partite, sometimes accrescent. Disk flat, cupular or annular, entire or lobed, rarely obsolete. Stamens equal in number to the petals, rarely more, inserted under (rarely on) the disk; filaments usually subulate; anthers 2-celled, basi- or dorsi- fixed. Ovary superior (half inferior in HOLIGARNA), 1- or 2-6- celled, rudimentary or 2-3-fid in the male (of 5-6 carpels in BUCHANANIA); ovule solitary in each cell, pendulous from the top or side of the cell or from an ascending basal funicle. Fruit superior (except in HOLIGARNA), usually a 1-5-celled, 1-5-seeded drupe; stone sometimes dehiscent. Seed exalbuminous; embryo straight or curved; cotyledons plano-convex; radicle short.—Genera 60. Species 500.—Chiefly tropical, but also Mideterranean, E. Asia, America.

A. Ovules pendulous from a basal funicle
- I. Sepals and petals not accrescent
  - a. Calyx 4-5-partite. Petals 4-6. Stamens 4-10. Leaves alternate, usually compound .... RHUS.
  - b. Calyx bipartite. Petals absent. Stamens 3-4. Leaves alternate, compound .... PISTACIA.
  - c. Calyx 4-5-partite. Petals 4-5. Stamens 1-5. Style filiform. Leaves alternate, simple .... MANGIFERA.
  - d. Calyx 5-partite. Petals 5. Stamens 8-10. Style filiform. Leaves alternate, simple .... ANACARDIUM.
  - e. Calyx 3-5-lobed. Petals 3-5. Stamens 10. Carpels 5-6, one only perfect. Styles short. Leaves alternate, simple .... BUCHANANIA.
- II. Sepals or petals accrescent. Leaves simple
  - a. Calyx spathaceous. Stamens 5 or numerous .... MELANORRHOEA.

B. Ovules pendulous from the top of the cell or from the walls of the ovary above the middle

I. Leaves trifoliolate or pinnate
    Calyx not accrescent. Petals imbricate. Stamens 8-10. Styles 3-4 .... LANNEA.
II. Leaves simple
    a. Petals imbricate. Stamens 5. Styles 3. Drupe on a much enlarged peduncle .... SEMECARPUS.
    b. Petals valvate. Stamens 5. Styles 3. Drupe inferior ... HOLIGARNA.
C. Ovary 2-5-celled. Ovules pendulous. Leaves pinnate
    Flowers polygamous. Stamens 8-10. Styles 4-5, free above .. SPONDIAS.

Astringent, antidiarrhœic, refrigerant. Occasionally irritant, rubefacient, narcotic.

Among the products isolated may be mentioned: (1) acids—anacardic, gallic, malic, rhustannic, toxicodendric, urushic—; (2) esters—methyl salicylate—; (3) gums and tannins; (4) oleoresins—mastic—; (5) fixed oils—cardol, Japan wax—; (6) volatile oils—turpentine—; (7) colouring matter—fisetin, myricetin, quercetin—; (8) glucosides—euxanthic acid, fustin—; (9) alcohols—bhilawanol, semecarpol, urushiol—; (10) toxic principles—toxicodendrol—.

OFFICIAL:—*Anacardium occidentale* Linn.=*Cassuvium pomiferum* Lamk. (Portugal).

Pistacia Lentiscus Linn. (Austria, Belgium, Germany, Norway, Portugal, Spain).— *γ-chia* De Candolle (Sweden),—var. *Chia* Duham.= *P. Chia* desfont. (Portugal); *P. Therebinthus* Linn. (Portugal); *P. vera* Linn. (Portugal).

Rhus Coriaria Linn. (Portugal); *R. glabra* Linn. (United States); *R. Toxicodendron* Linn.=*Toxicodendron pubescens* Mill. (Portugal).

Sorindeia trimera Oliv. (Portugal).

RHUS (Tourn.) Linn.

Trees or shrubs often with acrid juice. Leaves alternate, 3-foliolate or imparipinnate. Flowers small, in terminal and axillary panicles, polygamous. Calyx small, 4-6-partite, persistent; segments subequal. Petals 4-6, equal, spreading, imbricate. Stamens 4, 5, 6 or 10, inserted at the base of the disk, free; filaments subulate; anthers short, imperfect in the female flower. Ovary sessile, ovoid or globose, 1-celled; ovule pendulous from a basal

funicle; styles 3, free or connate, short or long; stigmas simple or capitate. Drupe small, dry, compressed; stone coriaceous, crustaceous or bony. Seed pendulous from the funicle; testa membranous; cotyledons flattish, radicle hooked, short, superior.—Species 130.—Subtropical and warm temperate regions.

A. Leaves trifoliolate	1.	*R. parviflora.*
B. Leaves odd-pinnate		
I. Leaflets pubescent or tomentose beneath		
a. Leaves 25-45 cm. Leaflets 4-6 pairs	2.	*R. semialata.*
b. Leaves 30-45 cm. Leaflets 3-5 pairs	3.	*R. wallichii.*
c. Leaves 30-45 cm. Leaflets 3-4 pairs	4.	*R. insignis.*
II. Leaflets quite glabrous beneath	5.	*succedanea.*

The genus contains various species which have the property of so violently irritating susceptible skins as to produce dermatitis. The fruits have been recommended for the treatment of paralysis, colics, diarrhœa.

The following are used medicinally in Europe—*R. coriaria* Linn., *R. cotinus* Linn.—; in Malaya—*R. semialata* Murr., *R. vernicifera* DC.—; in Indo China—*R. semialata* Murr.—; in China—*R. cotinus* Linn., *R. semialata* Murr., *R. Toxicodendron* Linn., *R. vernicifera* DC.—; in North America—*R. aromatica* Ait., *R. glabra* Linn., *R. toxicodendron* Linn., *R. typhina* Linn., *R. venenata* DC.—; in Cuba and Jamaica—*R. metopium* Linn.—; in South Africa—*R. divaricata* E. & Z., *R. erosa* Thunb., *R. gueinzii* Sond., *R. insignis* Del., *R. longifolia* Sond., *R. pyroides* Burch. var. *gracilis* (Engl.) Burtt-Davy, *R. undulata* Jacq., *R. viminalis* Vahl.—.

The toxic principle "toxicodendrol" has been found in *R. arborea* DC., *R. caustica* Hook. & Arn., *R. coriaria* Linn., *R. metopium* Linn., *R. toxicodendron* Linn., *R. venenata* DC.—.

OFFICIAL:—The leaves of *R. coriaria* Linn. and *R. toxicodendron* Linn.=*Toxicodendron pubescens* Mill. in Portugal.

The fruit of *R. glabra* Linn. in the United States of America.

1. **Rhus Parviflora** Roxb. Fl. Ind. II (1832) 100.—PLATE 268.

An evergreen or subdeciduous shrub usually 1.2-2.4 m. high, but attaining 0.9 m. girth and 4.5 m. high. Bark dark brown,

roughish, exfoliating in small woody scales. Blaze 7.6-9 mm., pink or red. Twigs pale reddish brown, rusty-tomentose. Leaves trifoliolate. Petiole 2.5-5 cm. long, tomentose. Leaflets 2.5-12.5 by 1.5-7.5 cm., the terminal much the largest, obovate, the basal portion entire and cuneately attenuate, the upper coarsely and irregularly crenate, rather thick, hairy on the nerves especially beneath; the lateral relatively broader and more rounded at the base, sessile. Flowers less than 2.5 mm. diam., yellowish green, in terminal panicles 10-20 cm. long, the lower branches axillary. Pedicels minute. Drupes 5 mm. long, ovoid, brown, glabrous, shining.

Distribution: N.-W. Himalaya, from the Sutlej to Nepal, 2,000—5,000 ft., Pachmarhi Hills in the Central Provinces, Rampa Hills in the Godavari District.

The fruit is used medicinally and when mixed with salt, is said to act like tamarind (Stewart).

Almora: Tang—; *Hindi:* Raitung, Tumra, Tung, Tungla—; *Garhwal:* Tunga, Tungla—; *Jaunsar:* Dungla, Ninas, Ninawa, Tumra—; *Kashmir:* Samak—; *Kumaon:* Tunga—; *North-West Provinces:* Dungla, Raitung, Raunel, Tumra, Tunga, Tungla—; *Punjab:* Raitung, Tumra, Tung, Tungla—.

2. **Rhus semialata** Murr. in Comm. Götting. VI (1784) 27, t. 3.—Plate 269.

A shrub or small tree, deciduous, young twigs pubescent. Leaves pinnate, 25-45 cm. long, rhachis usually narrowly winged between the upper pairs of leaflets. Leaflets 5-13, the lateral opposite, sessile, 5-10 cm. long, variable, from lanceolate or oblong to ovate or elliptic, acuminate, rather regularly and coarsely dentate or crenate, pubescent on the nerves above, tomentose beneath, the terminal leaflet on a marginate petiolule. Flowers 3.8 mm. across, pale yellowish green, very numerous, in large terminal tomentose panicles nearly as long as the leaves; bracts and pedicels minute. Calyx tomentose without, segments ovate. Petals thrice as long as the sepals, oblong, ciliate, with a thickened midrib which is bearded on the inner face near the base. Stamens exceeding the petals. Disk cupular, obscurely 10-lobed. Styles free or loosely cohering. Drupes 5 mm. long, orbicular, flattened, reddish brown, tomentose.

Distribution: Outer Himalaya ranges, 3,000—7,000 ft., from the Indus eastwards, Khasia and Naga Hills, Shan Hills, Upper Burma, Martaban.—China, Japan.

The fruit is given in colic (Stewart).

In the Cha-Pa mountains of Tongking an infusion of the fruits is prescribed in diarrhœa.

The Chinese use the galls medicinally as an expectorant and astringent, and they apply them topically to swellings and wounds.

In Annam the galls are given in paralysis.

Canton: Ng tsz—; *Chinese:* Wu tzu—; *Garhwal:* Damphela, Dasmila, Dhamila—; *Indo China:* Chu moi, Giem phu moc, Muoi, Ngu boi tu—; *Jaunsar:* Arkhoi, Tibri—; *Lepcha:* Takhril, Thanghaerkung—; *Malaya:* Ng phoo chee—; *Nepal:* Bakkiamela, Bhagmili, Bhakimlo—; *North-West Provinces:* Dakhmila, Dasvila—; *Punjab:* Arkhar, Arkol, Chechar, Dudla, Hulashing, Hulug, Kakkari, Kakkeran, Kashin, Knitri, Rashtu, Tatri, Tetar, Thissa, titri, Vansh, Vrash—; *Ranikhet:* Dharmil—.

3. **Rhus wallichii** Hook. f. in Fl. Brit. Ind. II (1876) 11.—PLATE 270.

A small deciduous tree up to 0.9 m. girth and 7.5 m. high. Bark dark brown, rough, rather deeply fissured, exfoliating in irregular hard woody scales. Blaze 9-13 mm., rather hard, pale yellow streaked with pink or pale orange, exuding a yellow or black juice. Branches smooth, ashy. Young shoots clothed with silky brown tomentum. Leaves pinnate, 30-60 cm. long; rhachis tomentose, not winged. Leaflets 5-9, rarely 11, the lateral opposite, the terminal one 11.5-23 by 4.5-10 cm., the lowest pair usually 6.3-11.5 cm. long; all elliptic or oblong, subcoriaceous, entire, shortly acuminate, pubescent and dark green with pale midrib above, pale and softly hairy beneath, with 15-25 pairs of parallel lateral nerves impressed above and prominent beneath. Petiolule of lateral leaflets 1.2-5 mm. long. Flowers 2.5-5 mm. diam., pale greenish yellow, faintly scented, subsessile, in dense stiff erect axillary tomentose panicles 10-30 cm. long. Drupes 7.5-9 mm. diam., globose, green, pubescent; exocarp dehiscent from the apex forming stellately

spreading segments which are united by their bases and form a support to the stone; mesocarp thick, white, waxy; endocarp bony.

Distribution: N.-W. Himalaya from Kashmir to Nepal, 2,000—7,000 ft.

The juice of the leaves is corrosive and blisters the skin (Stewart).

Garhwal: Konki—; *Jaunsar:* Archoi, Arkhoi—; *Nepal:* Bhalaio, Chosi—; *North-West Provinces:* Akoria, Bhalium, Kaunki, Kaunui—; *Punjab:* Arkhar, Arkol, Gadambal, Harku, Hulasa, Kambal, Lohasa, Rikhali, Rikhul, Urkur—.

4. **Rhus insignis** Hook. f. Fl. Brit. Ind. II (1876) 11.—Plate 271.

A small beautiful tree. Leaves odd-pinnate, 30-45 cm.; petiole terete, glabrous, not winged; leaflets 3-4 pairs, petiolulate, 15-25 by 7.5-12 cm., coriaceous, entire, elliptic or oblong, abruptly acuminate, glabrous and shining above, rusty, softly tomentose beneath, nerves 20-25 pairs, parallel. Panicles shorter than the leaves, axillary. Fruiting panicles stout, 25 cm., long-peduncled, branches spreading. Drupes scattered on the panicle, globose, 8 mm. diam.; epicarp thin, dry, bursting irregularly and enclosing a globose white mass of wax containing a very small flattened crustaceous stone.

Distribution: Sikkim, Himalaya, 3,000—6,000 ft., Khasia Hills, 4,000 ft.

The juice is a powerful vesicant.

Lepcha: Sehr—; *Nepal:* Kagphulai, Khagbalayo—.

5. **Rhus succedanea** Linn. Mant. II (1771) 221.—Plate 272.

A medium-sized deciduous tree, young shoots glabrous. Leaves pinnate, 30-60 cm. long; rhachis terete, glabrous. Leaflets 7-15, the lateral opposite or subopposite, 6.3-15 cm. long, ovate-oblong or lanceolate, long-acuminate, entire, thin, membranous, glabrous or nearly so, usually oblique; petiolules of the lateral leaflets 5-10 mm. long, slender. Flowers 3.8 mm. across, in slender, drooping, rather lax, axillary panicles, half as long as the leaves; pedicels 2.5-5 mm. long, often puberulous; bracts caducous. Calyx glabrous or nearly so, lobes ovate. Petals thrice as long as the calyx, oblong, obtuse,

The following are used medicinally:—In Europe *P. lentiscus* Linn., *P. vera* Linn.—; in Syria—*P. vera* Linn.—; in Barbary—*P. atlantica* Desf.—; in China—*P. khinjuk* Stocks, *P. terebinthus* Linn., *P. vera* Linn.—.

Official:—The oleoresin from *P. Lentiscus* Linn. (Austria, Belgium, Germany, Norway, Spain),— *γ-chia* De Candolle (Sweden),—var. *Chia* Duham.=*P. Chia* Desfont. (Portugal); *P. Terebinthus* Linn. (Portugal).

The fruit of *P. Lentiscus* Linn. and the seeds of *P. vera* Linn. in Portugal.

1. **Pistacia integerrima** Stew. ex Brandis For. Fl. (1874) 122, t. XXII.—*P. Khinjuk* Stocks, Duthie Fl. Upper Gang. Pl. I, 187.—*Rhus kakra singee* Royle Ill. Bot. Himal. 175.—Plate 273.

A tree, nearly glabrous. Leaves impari- or pari- pinnate, 15-23 cm. long, with fine pubescence along petioles and nerves while young; leaflets opposite or nearly so, 4-5 pairs; short-petiolulate, lanceolate from oblique base, entire, long-acuminate, with 10-18 arcuate lateral nerves, joined by reticulate veins. Flowers on lateral panicles, the leaves below on the previous year's wood. Male panicles short, compact, pubescent. Stamens 5, 6, or 7; anthers large, oblong, obtuse, deep red. Sepals much shorter than stamens. Female flowers on short pedicels, in long lax panicles. Calyx of 4 linear sepals, generally supported by 2 ovate bracts, shorter than sepals. Sepals and bracts deciduous. Style 3-fid nearly to the base, with broad recurved stigmas. Drupe dry, somewhat broader than long, 6 mm. broad, rugose, glabrous, grey when ripe.

Distribution: Trans-Indus, Salt Range, Punjab, outer ranges of N.-W. Himalaya, 1,500—8,000 ft.

The gall is bitter, hot, acrid; heavy to digest; anthelmintic; tonic, expectorant; removes "vata"; useful in cough, asthma, hiccough, dysentery, diseases of the blood, biliousness, fever, bronchitis, consumption, vomiting, thirst, delirium, tuberculous ulcers, bad taste in the mouth (Ayurveda).

The gall is bitter, acrid, hot, dry; good expectorant; useful in chronic bronchitis, hiccough, vomiting of children, dysentery, skin

diseases, psoriasis; allays thirst, fever; increases appetite; removes bad humours (Yunani).

Sushruta prescribes the galls in combination with other drugs for the treatment of snake-bite and scorpion-sting.

The galls powdered, fried with *ghee* and a little sugar added, may be given internally with good effect in dysentery.

The drug has a great reputation both in Hindu and Mohammedan medicine as a tonic, expectorant, useful in asthma, phthisis and other conditions of the respiratory tract. Its use in pulmonary affections is no doubt due to the presence of a fair amount of essential oil, while the large amounts of tannins present in the drug act as strong astringent. On the whole we found that the importance of the drug was very much overrated. It may be classed with the terebinthinate astringents. This drug appears to have no advantage over many of the stronger expectorants in the British Pharmacopoeia and its antiseptic action is not of higher order (Chopra and Ghosh).

The galls are not an antidote to snake-venom (Mhaskar and Caius) or scorpion-venom (Caius and Mhaskar).

Almora: Kakri—; *Bengal:* Kakra—; *Garhwal:* Kakar—; *Gujerati:* Kakra—; *Hindi:* Kakra—; *Jaunsar:* Kakkar, Kakroi—; *Kashmir:* Drek, Gurgu, Kakkar—; *Kumaon:* Kakra—; *Marathi:* Kakra—; *Punjab:* Drek, Gurgu, Kakar, Kakkar, Kakkeran, Kakkrangche, Kakkrei, Kakla, Kakra, Kakrain, Kangar, Khakkar, Khangar, Masna, Sarawan, Shne, Tanhari, Tungu—; *Pushtu:* Masna, Sarawan, Shne—; *Sanskrit:* Chakra, Chakrangi, Chandraspada, Ghosha, Karkatakhya, Karkati, Kasavinashini, Kolira, Kulingi, Mahaghosha, Natangi, Navanga, Shikhari, Vakra, Vanamurdhaja, Vishanika—; *Urdu:* Kakra—.

MANGIFERA Linn.

Trees. Leaves alternate, petioled, simple, entire, coriaceous. Flowers small, polygamous, in terminal panicles. Calyx 4-5-partite; segments imbricate, deciduous. Petals 4-5, free or adnate to the disk, imbricate; nerves thickened, sometimes ending in excrescences. Stamens 1-5, inserted just within the disk or on it, 1 usually more

perfect and much longer than the others, the others with imperfect or smaller anthers, or reduced to teeeth, or absent. Ovary sessile, 1-celled, oblique; ovule pendulous, funicle basal or inserted on the side of the cell above its base (rarely horizontal). Drupe large, fleshy; stone compressed, fibrous. Seed large, compressed; testa papery; cotyledons plano-convex, often unequal and lobed.—Species 30.—Indo-Malayan.

1. Disk tumid, usually 5-lobed, broader than the ovary. Petals free from the disk, inserted at its base .... 1. *M. indica.*
2. Disk narrow, often reduced to the form of a stalk to the ovary. Petals adnate to or inserted on the disk .... 2. *M. caesia.*

M. indica Linn. is used medicinally wherever it is found growing; *M. caesia* Jack. is also used in the Malay Penninsula.

1. **Mangifera indica** Linn. Sp. Pl. (1753) 200.—PLATE 274.

A large spreading evergreeen tree reaching 15 m. in height, all parts glabrous except the inflorescence. Leaves crowded at the ends of the branches, coriaceous 12.5-25 by 3.8-7.5 cm., oblong, or oblong-lanceolate, acute, acuminate or subobtuse, shining, entire, the margins often undulate, base narrowed; petioles 1.2-3.8 cm. long. Flowers monoecious, 5 mm. long, with a somewhat disagreeable odour, arranged in large many-flowered pubescent panicles longer than the leaves; pedicels short, thick; bracteoles ovate, small. Sepals ovate, concave, pubescent outside, shorter than the petals. Petals oblong, subacute, reflexed, glabrous, with 3 strong orange-coloured ridges on the inner face. Disk fleshy, 5-lobed. Stamen 1; filament subulate; anther purple. Ovary glabrous. Drupes large, fleshy, obliquely pyriform or subovoid, subcompressed 7.5-20 cm. long; stone compressed, fibrous, very hard.

Distribution: Probably indigenous in Burma, Sikkim, the Nambar forest in Assam, the Khasia Hills, in ravines on the higher hills of the Satpura range, in Khandesh and along the W. Ghats.—Cultivated in the tropics generally.

The root and the bark are acrid; cooling; astringent to the bowels.—The leaves are acrid; astringent to the bowels; cure "vata", "pitta", and "kapha".—The flowers are cooling and astringent to the bowels; improve taste and appetite; cause "vata"; cure

leucorrhoea, bad blood; good in dysentery, bronchitis, biliousness, urinary discharges.—The unripe fruit is acrid, sour, tasty; cures "vata", "kapha", biliousness, "tridosha", blood impurities; astringent to the bowels; cures throat troubles, ulcers, dysentery, urinary discharges, vaginal troubles.—The ripe fruit is sweet and oily; aphrodisiac, tonic; increases appetite; cooling; beautifies the complexion; astringent to the bowels; cures "vata"; heart troubles, urinary discharges, ulcers, blood impurities. If eaten in excess it causes loss of appetite, typhoid, blood impurities, eye sores. The seed is sweet, sour, acrid; cures vomiting, dysentery, burning in the region of the heart.—The oil from the seeds is acrid, sweet, bitter; cures stomatitis and "vata" (Ayurveda).

The bark is astringent and styptic; stops vomiting and diarrhœa. —The leaves cure piles; their smoke stops hiccough.—The flowers improve "kapha" and enrich the blood.—The fruit has flavour and taste; sweet; tonic to the body, the liver, the spleen; laxative, diuretic, stomachic; improves the complexion; removes bad smell from the mouth; clears the brain; dispels langour and burning of the body; good in cough, piles, thirst, and pain in the liver.—The seed is astringent to the bowels and used in chronic diarrhœa; cooling, aphrodisiac; a good collyrium (Yunani).

The unripe fruit is said to be useful in ophthalmia and eruptions, and the seeds in asthma.

The rind of the fruit is astringent and also a stimulant tonic in debility of the stomach.

The ripe fruit is considered laxative, and therefore much prized by persons labouring under habitual constipation. The bark and kernel are known as astringent and used in hæmorrhage, diarrhœa and other discharges. The decoction of the kernel, either alone or in combination with bel and ginger, is generally prescribed in diarrhœa. The juice of the kernel, if snuffed, can stop nasal bleeding. The kernel is also described as an anthelmintic and containing a large quantity of gallic acid, highly useful in bleeding piles and menorrhagia.

The fruit, whether green or ripe, is dried in the sun and recommended as an antiscorbutic.

The bark and the fruit are considered very useful in cases of hæmorrhage from the uterus, lungs, or intestines.

The smoke of the burning leaves is supposed to have a curative effect in some affections of the throat.

The resinous juice from the bark is considered antisyphilitic; it is used on the Malabar Coast as a specific for diarrhœa and dysentery, and as a cure for scabies and cutaneous affections.

The root, bark, stem, and leaf are prescribed in combination with other drugs for the treatment of snake-bite (Sushruta, Sharangdharsamhita). The leaves in combination with other drugs are prescribed for scorpion-sting (Sushruta).

In some parts of West Africa the young bark forming over wounds on the Mango tree, is used to cure piles, and its extract in wasting diseases.

In Madagascar the bark is used as an astringent; the fruit as a depurative, diaphoretic and antipyretic; the seed as an astringent and anthelmintic.

Introduced into America in the form of fluid extract, either from the fruit or the rind. Astringent with a specific tonic action on mucous membranes. Its effects are great in diphtheria and other malignant throat diseases. The fluid extract applied locally is very useful in hæmorrhages.

In Brazil, the flowers of the mango are used either in the form of tea or powder for catarrh of the bladder. The powder is also used in the form of fumigation against mosquitoes.

All parts of the plant are equally useless in the antidotal treatment of snake-bite (Mhaskar and Caius). The leaves are not an antidote to scorpion-venom (Caius and Mhaskar).

Annam: Cay xoai, Mang qua thu—; *Arabic:* Abnig—; *Ashanti:* Mango, Mano, Manodua—; *Assam:* Am, Ghariam—; *Baigas:* Ama—; *Bengal:* Am, Ambra—; *Bombay:* Am, Amb, Amba, Ambo—; *Brazil:* Mangaiba—; *Bundelkhand:* Am, Amb, Anv—; *Burma:* Thayet—; *Cambodia:* Soai—; *Canarese:* Amba, Ballimavu, Chandramavu, Jiragemavu, Mavina, Mavu, Rasala, Simavu, Suka, Toremavu—; *Ceylon:* Kaddum—; *Chinese:* An Lo Kuo—;

Deccan: Am, Amba—; *Dehra Dun:* Ambi—; *English:* Cuckoo's Joy, Cupid's Favourite, Mango Tree, Spring Tree—; *French:* Abricotier de St. Domingue, Ambo, Freycinet, Loubi, Manguier, Saint Michel—; *Fulah:* Bodo Porto—; *Garo:* Bocho, Jegachu—; *German:* Mango—; *Gond:* Marka—; *Gujarat:* Ambo, Amri—; *Hausa:* Mangoro—; *Hindi:* Am, Amb—; *Indo China:* Ma muang, Mang qua, Swai, Xoai—; *Jolo:* Mampalam—; *Khond:* Maha—; *Kolami:* Uli—; *Konkani:* Ambo—; *Kurku:* Ambe—; *Lambadi:* Ambaro—; *La Reunion:* Manguier—; *Lepcha:* Ambhi—; *Madagascar:* Manga—; *Magahi:* Tsaratpang—; *Malaya:* Mangga, Mampalam—; *Malayalam:* Amram, Cutam, Gomanne, Manna, Mavu, Muchi, Nattumavu, Tenmavu—; *Marathi:* Amba—; *Nepal:* Angp—; *North-Western Provinces:* Am, Amb, Anv—; *Persian:* Amba, Ambeh, Naghyak—; *Portuguese:* Mangueira—; *Punjab:* Am, Amb, Mawashi—; *Saharanpur:* Ambi—; *Sanskrit:* Alipriya, Amra, Atisairrabha, Bhramarapriya, Bhringabhishta, Chukralatamra, Chuta, Chutaka, Gandhabandhu, Kamanga, Kamaphala, Kamarasa, Kamashara, Kamavallabha, Kamayudha, Kameshta, Keshavayudha, Kireshta, Kokilananda, Kokilavasa, Kokilotsava, Koshi, Madadhya, Madhavadruma, Madhuduta, Madhukara, Madhuli, Madhvavasa, Madirasakha, Makanda, Manjari, Manmathalaya, Manmathavasa, Manodna, Modakhya, Mrishalaka, Nilakapittha, Nriyapapriya, Parapushtamahotsava, Phalashreshtha, Phalotpatti, Pikapriya, Pikaraga, Pikavallabha, Priyambu, Rasala, Sahakara, Shatpadatilhi, Shareshta, Shukrapriya, Sidhurasa, Sripriya, Sumadana, Vanotswa, Vasantadru, Vasantaduta—; *Santal:* Ul—; *Sind:* Amb, Amu—; *Sinhalese:* Amba, Etamba, Makanda, Walamba—; *Soussou:* Mango—; *Swahili:* Mwembe—; *Tagalog:* Manga, Mangga—; *Tamil:* Adishelarayam, Ambiram, Amiram, Iradam, Kachakkar, Kilimukkuma, Kogilorsavam, Kokku, Ma, Madi, Madududam, Magandam, Malai, Mamagam, Mandi, Manmadanganai, Mattiyagandam, Mirudalagam, Omai, Palashiratta, Palorbatti, Pigubandu, Shedaram, Shegaram, Shudam, Shulli, Tema, Tevam, Tidalam—; *Telugu:* Amramu, Elamavi, Gujjumamidi, Makandamu, Mamidi, Mavi, Mavidi, Rasamamidi, Sutamu, Tiyyamamidi—; *Tulu:* Kukku, Kulike—; *Twi:* Mango,

Mano, Manodua—; *Urdu:* Amba—; *Uriya:* Ambo, Amo, Boulo, Chuto, Uda—; *Visayan:* Manga, Mangga—.

2. **Mangifera caesia** Jack in Roxb. Fl. Ind. II (1832) 441.

About 18 m. tall. Leaves thickly coriaceous, lanceolate to elliptic-lanceolate short acuminate, narrowed at base, midrib stout; nerves 20-25 pairs, prominent, 15-30 cm. long, 5-9 cm. wide; petioles thick, 9-13 mm. long. Panicles over 30 cm. long, much-branched, pubescent, dense-flowered. Flowers 7.5 mm. long, pale lilac. Sepals 5, lanceolate pubescent. Petals 5, twice as long, linear with central ridge. Stamen 1, shorter; staminodes minute. Drupe 15 cm. or more long, thick, dirty white.

Distribution: Malay Peninsula.—Malay Islands.

The sap sets up an acute dermatitis when it touches the skin, causing much swelling, followed by the pustular eruption which sometimes ends in chronic ulceration.

An infusion of the root is used in Kelantan as an antidote to poisoning by "rengas" (*Gluta spp., Melanorrhoea spp., Stagmaria verniciflua* Jack.).

Malay: Binjai—.

ANACARDIUM Rottb.

Shrubs or trees. Leaves alternate, petioled, simple, coriaceous, quite entire. Flowers polygamous, in terminal bracteate panicles. Calyx 5-partite, deciduous, erect, imbricate. Disk filling the base of the calyx, erect. Stamens 8-10, all or some fertile; filaments connate and adnate to the disk. Ovary obovoid or obcordate; ovule 1, ascending from a very short lateral funicle. Nut reniform, seated on a large pyriform fleshy body, formed of the enlarged disk and top of the peduncle; pericarp cellular and full of oil. Seed reniform, ascending; testa membranous, adherent; cotyledons semilunar; radicle short, hooked.—Species 8.—Tropical America, 1 naturalized in Asia.

A. occidentale Linn. is used medicinally wherever it is found growing. The fruit and pericarp are officinal in Portugal.

1. **Anacardium occidentale** Linn. Sp. Pl. (1753) 383.—PLATE 275.

A small tree with a short thick crooked trunk; branches terete, glabrous. Leaves coriaceous, 10-15 by 3.8-7.5 cm., obovate or elliptic, rounded at the apex, glabrous, finely reticulately veined, base cuneate; main nerves 10-12 pairs, prominent beneath; petioles 9-15 mm. long. Panicles terminal, longer than the leaves, the branches cymose; peduncles lengthening with age; bract 5-10 mm. long, ovate, very acute, nerved, puberulous outside. Sepals 4 mm. long, lanceolate, puberulous outside. Petals 8-12 mm. long, linear-lanceolate, deflexed from the middle, minutely puberlous outside. Stamens about 9, one longer than the others, the longer one exserted beyond the recurved petals. Ovary about 2 mm. long, glabrescent, attenuated into a subulate style 4 mm. long. Fruit reniform, 2.5 cm. long, its pedicel large, fleshy, dark coloured.

Distribution: A native of tropical America, naturalized and cultivated in India, especially near the coast.

The fruit is acrid, sweet, hot; digestible, aphrodisiac, anthelmintic; cures "vata" and "kapha", tumours, ascites, fever, ulcers, leucoderma and skin diseases, dysentery, piles, loss of appetite (Ayurveda).

The bark is said to have alterative properties. The root is considered purgative and the fruit antidiarrhœal.

The tar from the bark is used as a counter-irritant. As an external application it has been recommended in leprosy, ringworm, corns, and obstinate ulcers; it is powerfully rubefacient and vesicant, and requires to be used with caution.

In Europe a tincture of the pericarp has been used as a vermifuge.

The bark and the inflorescence enter into the composition of a large number of prescriptions recommended for the treatment of snake-bite (Bapat).

In the Gold Coast the bark and leaves are used medicinally in curing toothache and sore gums.

The kernel is nutritive, demulcent and emollient; and the oil

Deccan: Kaju—; *English:* Cashew Apple, Cashew Nut, West Indian Cashew Nut—; *French:* Acajou ă fruit, Acajou ă pommes, Anacardier, Cajou, Ecorce antidiabétique, Noyer d'acajou, Pommier de Cajou—; *Ga:* Atinga—; *German:* Acajou, Caschunuss—; *Gujerati:* Kaju—; *Hausa:* Kanju—; *Hindi:* Kaju—; *Ilocano:* Bollogo—; *Indo China:* Dao lon hot, Gia nhu thu, Swai chanti—; *Konkani:* Kazu—; *Krobo:* Atinga—; *Malay:* Buas gajus, Jambu monyet, Janggus, Kaju—; *Malayalam:* Kappalsera, Kappalmavu, Kashumavu, Parangimavu, Patirimavu, Portugimavu—; *Marathi:* Kaju, Kajucha bi—; *Mexico:* Maranon—; *Portuguese:* Cajueiro—; *Sanskrit:* Agnikrita, Arushkara, Guchhapushpa, Kajutaka, Parvati, Prithagabija, Sophara, Sophahara, Srigdhapitaphala, Upapushpika, Vrittapatra—; *Sinhalese:* Kaju, Kaju atta—; *Spanish:* Acaju, Acayoiba del Brasil, Casoi de Filipinas, Merey del Orinoco—; *Swahili:* M Kanju—; *Tagalog:* Balubad, Casoy, Casuy—; *Tamil:* Andima, Kallarma, Kottaimundiri, Mundiri, Saram, Sigidima, Tirigai, Uttumabalam—; *Telugu:* Jidimamidi, Mokkamamidi, Muntamamidi—; *Tulu:* Gonkuda—; *Twi:* Atinga—; *Uriya:* Bholliaambo, Hijilabodamo, Lonkabhollia—; *Visayan:* Casoy—.

BUCHANANIA Spreng.

Trees. Leaves alternate, petioled, simple, coriaceous, quite entire. Flowers hermaphrodite, small, white, in terminal and axillary branched panicles. Calyx short, obtusely 3-5- toothed or -lobed, persistent, imbricate. Petals 4-5, oblong, imbricate, at length recurved. Disk orbicular, 5-crenate. Stamens 8-10, free, inserted at the base of the disk. Carpels 5-6, free, seated in the cavity of the disk, one fertile, the others imperfect; ovule 1, pendulous from a basal funicle; style short; stigma truncate. Drupe small, scantily fleshy; stone crustaceous or bony, 2-valved. Seed gibbous, acute at one end; cotyledons thick; radicle superior.—Species 20. —Tropical Asia.

The genus is therapeutically inert.

1. **Buchanania lanzan** Spreng. in Schrader, Journ. IV

(1801) 234.—*B. latifolia* Roxb. Hort. Beng. (1914) 32.—PLATE 276 (under *B. latifolia* Roxb.).

A tree 12-15 m. high, with straight trunk; young branches clothed with silky hairs. Leaves thickly coriaceous, 12.5-25 by 6.3-12.5 cm., broadly oblong, obtuse, sometimes emarginate, glabrescent above, more or less villous beneath, reticulately veined, the nerves and veins impressed on the upper surface, base rounded; main nerves 10-20 pairs; petioles about 12 mm. long. Flowers small sessile, greenish white, in terminal and axillary pyramidal ferrugineo-pilose panicles which are shorter than the leaves; bracts small, caducous. Calyx-lobes short, broadly ovate, ciliate. Petals 2.5 mm. long, ovate-oblong, subacute. Disk fleshy. Stamens 10, a little shorter than the petals; filaments flattened; anthers about as long as the filaments. Ovaries: 1 perfect, conical, villous, the other 4 reduced to cylindrical filaments. Drupes obliquely lentiform 8-12 mm. in the long diameter, black; stone hard, 2-valved.

Distribution: Hot and drier parts of India, Burma,—Yunnan, Cambodia, Cochin-China, Siam, Laos.

The root is acrid; removes "kapha" and biliousness; cures blood diseases.—The fruit is sour, sweet, fattening, laxative, binding, cooling, aphrodisiac; cures "vata"; biliousness, fevers, thirst, ulcers, blood diseases.—The seed is sweet; aphrodisiac, cardiotonic, astringent to the bowels; cures biliousness and burning sensation of the body.—The oil is sweet; indigestible, hot; causes "kapha"; removes "vata" and biliousness (Ayurveda).

The juice of the leaves is digestive, expectorant, aphrodisiac, purgative; purifies the blood; allays thirst; lessens biliousness.—The seeds have a slightly bitter pleasant taste; expectorant, tonic to the body and the brain, aphrodisiac, stomachic; remove bad humours; useful in gleet and urinary concretions; good in fevers; cause headache (Yunani).

The oil extracted from the kernels of the fruit is used as a substitute for almond oil in Native medicinal preparations and confectionery. It is also applied to glandular swellings of the neck.

In the Jhansi District, the kernel worked up into an ointment, is

used in skin diseases. It is believed to cure pimples, prickly heat, and itch.

In Berar, kernels pounded and applied outwardly are used as a remedy for itch; also employed by women to remove spots and blemishes from the face.

In the Bombay Presidency, the kernel is employed as a tonic, being sometime substituted for the almond.

In the Madras Presidency, the gum with goat's milk is given internally for intercostal pains. It is also administered in diarrhœa.

In the Central Provinces, the roots and leaves, pounded and mixed with butter-milk, are taken in cases of diarrhœa. The fruit is used by Hakims in tonic medicines and for applying to the tongue when inflamed or very hard.

Almora: Mairia, Muria—; *Arabic:* Habulsamnah—; *Badaga:* Irippa—; *Bengal:* Piyal—; *Bhil:* Sir—; *Bhumij:* Pial—; *Bombay:* Charoli, Piyal—; *Burma:* Lambo, Lamboben, Loneopomaa, Lonepho, Lonpo, Lunbo—; *Canarese:* Charpoppu, Kolegeru, Kolemavu, Morale, Morave, Murukali, Muruke, Morante, Nurukkal—; *Central Provinces:* Achar, Char—; *Cutch:* Charoli—; *Dehra Dun:* Kathbilawa—; *Garhwal:* Katbhilawa, Muria, Payala, Pial, Pural—; *Gond:* Herka, Saraka—; *Gujarat:* Charoli—; *Haldwani:* Mairia, Muria—; *Hindi:* Achar, Char, Paira, Piyal, Piyala, Piyar—; *Hyderabad:* Charwari—; *Kadir:* Mural, Miralkanji—; *Kharwar:* Peea—; *Kolami:* Tarum—; *Koya:* Jarugu—; *Kurku:* Taro—; *Lambadi:* Salali, Siravuli—; *Lansdowne:* Kathbhilawa, Pial, Pural—; *Malayalam:* Kalamavu, Mungaperlu, Munnalperu, Muralkalu, Mural, Nuruvi—; *Marathi:* Char, Chirauli, Chironji, Pyalchar—; *Oudh:* Peira, Perrah, Piar—; *Persian:* Nakulekwajah—; *Punjab:* Chiroli, Chironji—; *Ramnagar:* Kathbhilawa, Pial, Pural—; *Sanskrit:* Akhatta, Bahulavalkala, Chara, Charaka, Dhanu, Dhanushpatta, Drusallaka, Hasannaka, Kharaskandha, Lalana, Mokshavirya, Pata, Piyalaka, Priyala, Rajadana, Sannakadru, Snehabija, Tapasapriya, Tapaseshtha, Upavata, Viyala—; *Santal:* Sarop—; *Saora:* Jarumamidi—; *Tamil:* Ayma, Kattuma, Mudaikkai, Mudaima, Muraiyidam, Morala, Sarai—; *Telugu:* Chara, Charumamidi,

Jarumamidi, Jvaramamidi, Moralli, Sara, Sinnamoralli—; *Tulu:* Irippa—; *Urdu:* Chironji—; *Uriya:* Charo, Priyalo—.

MELANORRHŒA Wall.

Leaves coriaceous, simple, quite entire. Flowers large, bisexual, in axillary panicles. Sepals 5, cohering in the species here described into a pointed deciduous cap. Petals 5-8, imbricate, linear-oblong, persistent and, as a rule, much enlarged in fruit. Stamens 5 or numerous, inserted on a thick hemispheric or columnar disk. Ovary stalked, oblique, 1-celled. Fruit a dry drupe, more or less stalked.—Species 10.—Malaya.

1. Stamens many. Fruit pedicelled .... 1. *M. usitata.*
2. Stamens 5. Fruit subsessile .... 2. *M. wallichii.*
3. Stamens 10. Fruit stalked .... 3. *M. curtisii.*

In the Malay Peninsular *M. curtisii* Oliv. and *M. wallichii* Hook. f. are considered highly poisonous.

1. **Melanorrhoea usitata** Wall. Pl. As. Rar. t. 11, 12; Brandis Ind. Trees (1911) 202, fig. 89.—PLATE 277.

A deciduous tree, all younger parts villous; bark thin, irregularly breaking up into small angular thin flakes. Leaves oblong or obovate-cuneate, decurrent on the strong densely pubescent petiole which is often up to 2.5 cm. long, blunt or acute, entire, rather chartaceous, while young on both sides densely and softly villous, when adult turning shortly and densely pubescent, 23-30 cm. long, the parallel nerves and net-veination conspicuous. Flowers white, middling sized, on 8.5-12.5 mm. long tomentose pedicels, laxly cymulose, forming densely pubescent or tomentose panicles in the axils of the upper leaves and much shorter than them; sepals white, lanceolate, puberulous, 8.5-10.5 mm. long, only at the base free, hoodlike cohering at the apex; petals lanceolate, acute, 10.5 mm. long, pubescent; drupes globular, the size of a cherry, smooth, on a thick hardly 8.5-10.5 mm. long stalk; petals wing-shaped, stellately spreading, oblong, about 5 cm. long, much veined, purplish, glabrous.

Distribution: Upper and Lower Burma, chiefly in English forests.—Siam to the Mekong river.

The thick fluid which is found in every part of the plant has been used successfully as an anthelmintic.

The main constituent of the varnish is urushic acid which amounts to about 85 per cent (Puran Singh; *Ind. For. Records;* Vol. I, part IV).

Burma: Thitsaypen, Thitsi—; *French:* Arbre de Matachou, Arbre à vernis—; *Indo China:* Thit si—; *Karen:* Kia hong—; *Manipur:* Kheu—; *Taleing:* Suthan—.

2. **Melanorrhoea wallichii** Hook. f. Fl. Brit. Ind. II, 25.—*M. Maingayi* Hook. f. l. c.

Tree 24-30 m. tall. Leaves coriaceous, elliptic-obovate obtuse or rounded, narrowed to base; glabrescent; nerves 12-16 pairs, prominent on both sides, 9-15 cm. long, 5-7.5 cm. wide; petioles 2.5-3.2 cm. long. Panicles terminal and axillary at the branch ends, over 30 cm. long, white, softly hairy, branchlets few-flowered. Flowers 1.3 cm. across, white; pedicels 7.5 mm. long. Petals lanceolate, white woolly, disk black. Stamens 5. Fruit oblong, black sessile in the corolla wings, which are linear-oblong blunt, papery, 5.3 cm. long, 1.3 cm. across, bright red.

Distribution: Malay Peninsula.—Borneo.

The sap when it touches the skin causes violent inflammation, with smarting and burning pain, followed by an eruption of blebs filled with matter.

Internally it acts as a violent irritant causing vomiting and purging.

In Kelantan an infusion of the root is used as an antidote for poisoning by "binjai" (*Mangifera caesia* Jack.).

Malay: Rengas manuk—.

3. **Melanorrhoea curtisii** Oliv. in Hook. Ic. Pl. t. 1513.

Tree. 12-24 m. tall, glabrous. Leaves coriaceous, oblong-lanceolate or oblanceolate blunt, narrowed at base; nerves faint, 12-16 pairs, 7.5-12.5 cm. long, 3.2-5 cm. wide; petioles 1.3-2 cm. long, slender. Panicles 10-18 cm. long; branches 7.5 cm. or less, slender remote puberulous, few-flowered at tip. Flowers 6 mm. long; buds narrow. Calyx conic acute calyptrate 2.5 mm. long. Petals 5,

linear, acute. Stamens 10, shorter. Drupe depressed, globose, 1.3-2 cm. long on a stalk 9 mm. long, black; petal-wings linear, narrowed to the base, 5.7 cm. long, 1 cm. across, red.

Distribution: Malay Peninsula.

The properties are the same as those of *M. wallichii.*
Malay: Rengas—.

LANNEA A. Rich.
(ODINA Roxb.)

Trees with stout soft branches. Leaves few at the ends of the branches, alternate, usually imparipinnate, deciduous; leaflets opposite, quite entire. Flowers small, monoecious or dioecious, fascicled, shortly pedicelled, in simple and panicled terminal fascicled racemes. Calyx 4-5-lobed, persistent; lobes rounded, imbricate. Disk annular, crenate. Male flowers: Stamens 8-10 inserted below the disk. Ovary 4-5-partite. Female flowers: Ovary sessile oblong, 1-celled; ovule 1 in each cell, pendulous from near its apex by a long funicle, often abortive in 3 of the cells; styles 3-4, stout; stigmas simple or capitellate. Drupe small, compressed, oblong, subreniform, crowned by the distant styles; stone hard. Seed compressed, embryo curved; cotyledons flat, fleshy, radicle superior.—Species 15.—Tropical Africa and Asia.

L. grandis Engl. is used medicinally in Indo China and the Philippine Islands, *L. afzelii* Engl. in the Gold Coast, *L. discolor* Engl. in South Africa.

1. **Lannea grandis** Engl. in Engl. & Prantl. Pflanzenf. Nachtr. I, 214.—*Calenum grande* O. Ktze. Rev. Gen. I (1891) 151.—*Haberlia grandis* Dennst. Schluss. Hort. Malab. (1818) 30.—*Lannea Woodier Parker* Fl. Punj. 118.—*Odina Woodier* Roxb. Hort. Beng. (1814) 29.—PLATE 278 (under *Odina Woodier* Roxb.).

A large tree 12-15 m. high; trunk thick; bark ash-coloured, smooth, exfoliating; young parts more or less stellately puberulous. Leaves crowded about the ends of the branches, 25-45 cm. long; leaflets membranous, green above, brown beneath (when dry), 3-5

pairs and an odd one, 7.5-15 by 2.5-5 cm., ovate-oblong; acuminate, glabrous, shining, tinged with pink when young, base acute or rounded, often oblique; main nerves 6-8 pairs; petiolules of the lateral leaflets 0-3 mm. long, those of the terminal leaflets much longer. Flowers purplish, appearing when the tree is bare of leaves, crowded in cymose fascicles, the male racemes compound, the female simple; pedicels very short, fulvous-pubescent; bracts ovate, acute, pubescent outside, ciliate. Calyx-lobes about 1.25 mm. long, ovate-orbicular, ciliate. Petals 4, ovate-oblong, acute, 3-4 mm. long. Stamens in the male flowers equalling the petals. Ovary in the female ovoid-oblong, in the male rudimentary, 4-lobed. Drupes reniform, compressed, red.

Distribution: Common in deciduous forests throughout India, Ceylon, Burma, in the sub-Himalayan tract extending to the Indus, ascending to 4,000 ft. in the outer hills.—Cambodia, Siam, Cochin-China. Malaya.

The bark is sweet, hot, acrid; stomachic; useful in vaginal troubles; allays thirst; dispels foul breath; cures ulcers, sprains, bruises, skin eruptions, heart diseases, " vata " and dysentery.—The leaves are a useful application in elephantiasis of the leg. (Ayurveda).

The astringent bark is used as a lotion in impetiginous eruptions and obstinate ulcerations. It is considered a valuable application to old and obstinate ulcers as also to leprous ulcers.

The gum beaten up with cocoanut milk, is applied to sprains and bruises, and the leaves boiled in oil are used for a similar purpose (Wight).

In Bengal the juice of the green branches, in a four-ounce dose mixed with two ounces of tamarind, is given as an emetic in cases of coma or in insensibility produced by opium or other narcotics.

In some parts of the Madras Presidency and Burma, the leaves are used for all local swellings and pains of the body. They are first boiled and then applied.

In Burma, a decoction of the bark is used for toothache. A decoction of the inner bark is often used in the form of a poultice as a remedy for festering wounds, sores, or boils while the dried and powdered bark is also used as a tooth powder by poor villagers.

In the Philippine Islands the bark is considered astringent and used for washing inveterate wounds.

A decoction of the bark 1 in 10 was administered in one ounce doses to cases of diarrhœa and dysentery and the result was very unsatisfactory (Koman).

Ajmere: Gol—; *Bengal:* Bhadi, Bohar, Ghadi, Jial, Jiol, Jir, Jival, Jiyal, Lohar—; *Bombay:* Gajel, Ginyan, Kimul, Moi, Moina, Moja, Molarda, Moya, Shembat, Shimti, Simati—; *Bundelkhand:* Gunj—; *Burma:* Hnanbai, Hnanbe, Nabe, Nabhai, Nabhay—; *Canarese:* Ajasringi, Dhumpari, Godde, Haleberi, Kuratige, Puneb, Shinti, Udi—; *Central Provinces:* Gunja, Mageer, Mouni, Moyen—; *Garhwal:* Kalmina, Kanman—; *Gond:* Gharri, Gumpri, Gup, Kaikra—; *Gujerati:* Mavedi, Modol, Moledu—; *Hindi:* Ginyan, Jhingan, Jingan, Kaimil, Kamlai, Kashmala, Kiamil, Kimul, Mohin, Moween, Moyen—; *Khond:* Dope—; *Kolami:* Dhoka, Dowka—; *Konkani:* Moi—; *Kumaon:* Jhinghan—; *Kurku:* Kekeda—; *Lambadi:* Bungaro—; *Las Bela:* Buhi—; *Magahi:* Hneingpyoing—; *Malayalam:* Anakkaram, Kalayasam, Oti, Uti—; *Marathi:* Moi, Moja, Moye, Munidi, Shimat, Shimti—; *Mundari:* Dokadaru—; *Nepal:* Bara, Dabdabbi, Halloray—; *North-Western Provinces:* Jhingan, Jiban, Sindan—; *Portuguese:* Bainheiro—; *Punjab:* Batrin, Dhauntika, Dila, Kambal, Kamlai, Kemal, Kemball, Kiamil, Kimlu, Koamla, Lidra, Pichka, Sulambra—; *Rajputana:* Gob—; *Sanskrit:* Ajasringi, Jhingi, Jhingini, Jingini, Jivala, Kvala, Manjari, Netraushadhi, Parvati, Pramodini, Suniryasa—; *Santal:* Doka—; *Sind:* Moya, Simati—; *Sinhalese:* Hik—; *Tagalog:* Amugis—; *Tamil:* Anaikkarai, Appiriya, Odi, Udi—; *Telugu:* Appiriyada, Dhumpari, Gumpena, Vaddi, Oddi—; *Tulu:* Udi—; *Uriya:* Gongoromohi, Indromohi, Jiyolo, Mohi—; *Visayan:* Amugis—.

SEMECARPUS Linn. f.

Trees. Leaves alternate, simple, quite entire, coriaceous. Flowers small, polygamous or dioecious, in terminal (rarely axillary) panicles. Calyx 5-6-fid; segments deciduous. Petals 5-6, imbricate. Disk broad, annular. Stamens 5-6, inserted at the base of the disk,

imperfect in the female flowers. Ovary very rudimentary or 0 in the male flowers; in the female superior, 1-celled; ovule pendulous from the apex of the cell, funicle short; styles 3; stigmas subclavate. Drupe fleshy, oblong, subglobose or reniform, oblique, seated on a fleshy receptacle formed of the thickened disk and calyx-base; pericarp charged with acrid resin. Seed pendulous; testa coriaceous, the inner coat somewhat fleshy; embryo thick; cotyledons plano-convex; radicle superior.—Species 40.—Indo-Malayan.

S. anacardium Linn. is the only species used medicinally.

1. **Semecarpus anacardium** Linn. f. Suppl. (1781) 182; Roxb. Cor. Pl. I, t. 12; Wight Ic. t. 558.—Plate 279.

A moderate sized tree. Leaves 18-60 by 10-30 cm., obovate-oblong, rounded at the apex, coriaceous, glabrous above, ashy grey or buff and more or less pubescent beneath and with cartilaginous margins, base rounded, cordate or cuneate, sometimes shortly auricled; main nerves 15-25 pairs making a large angle with the costa, sometimes nearly horizontal, prominent on both surfaces; petioles 1.2-3.8 cm. long. Flowers greenish white, subsessile, fascicled in pubescent panicles which are equal to or shorter than the leaves, the female panicles shorter than the male; pedicels short; bracts lanceolate, pilose. Calyx-segments about 1 mm. long, pilose outside. Petals 4-5 mm. long by 2 mm. broad, ovate, acute. Ovary in the male flowers rudimentary, hairy; in the female subglobose, densely pilose, crowned with the 3 styles. Drupes 2.5 cm. long, obliquely ovoid or oblong, smooth and shining, black when ripe, seated on a fleshy receptacle or hypocarp about 2 cm. long, smooth and yellow when ripe.

Distribution: Sub-Himalayan tract from the Bias eastwards, ascending in the outer hills up to 3,500 ft., Assam, Khasia Hills, Chittagong, Central India and the Western Peninsula.—E. Archipelago, N. Australia.

The fruit is acrid, hot, sweetish; digestible, aphrodisiac, anthelmintic; stays looseness of bowels; removes " vata ", " kapha ", ascites, skin diseases, piles, dysentery, tumours, fevers, loss of appetite, urinary discharges; heals ulcers; strengthens the teeth; useful in insanity, asthma.—The rind of the fruit is sweet, oleagenous,

digestible, acrid, sharp; stomachic, anthelmintic, laxative; cures "vata", bronchitis, leprosy, ulcers, ascites, piles, dysentery, tumours, inflammations, fevers; causes ulceration (Ayurveda).

The sweet fruit is carminative, tonic, aphrodisiac; lessens inflammation, stomatitis, piles, fever, weakness and paralysis; expels bad humours from the body.—The pulp is tonic; good for piles.—The smoke from the burning pericarp is good for tumours.—The oil is hot and dry, anthelmintic, aphrodisiac, tonic; makes hair black; good for leucoderma, coryza, epilepsy and other nervous diseases; lessens inflammation; useful in paralysis and superficial pain; causes burns, ulcers, blebs (Yunani).

The Telinga physicians use it as a specific in all kinds of venereal affections (Roxburgh). A brown gum exudes from the bark which the Hindus regard as a valuable medicine in scrofulous, venereal and leprous affections (Ainslie). An oil from the nut acts as a vesicant in rheumatism and sprains (Ainslie).

In Goa, the nut is used internally in asthma after having been steeped in butter-milk, and is also given as vermifuge. In the Konkan, a single fruit is heated in the flame of a lamp and the oil allowed to drop into a quarter-seer of milk; this draught is given daily in cough, caused by relaxation of the uvula and palate.

The bruised nut is applied to the os uteri by the native women to procure abortion.

Basiner found that within 12 hours the brown oil of the nut raised a black blister; this should be carefully protected from touch, as the fluid causes eczematous vesicles on any part of the body it may come in contact with. He has also noticed painful micturition, the urine being reddish brown and bloody, and painful stools, as a sequel to the external application of the oil (*Am. J. of Pharm.* 1882).

The juice of the root-bark is also used medicinally on account of its acrid properties.

"I have used the black, thick and acrid oil of the marking-nut, prepared either by expression or with the aid of heat, or the nut itself, in the form of electuary, pretty extensively in my practice, and found it so efficacious in acute rheumatism that it may be considered a

specific in that disease. The drug is also of great service in asthma, and more or less beneficial in secondary syphilis, haemorrhoids, neuralgia, epilepsy, anaesthesia, paralysis, lepra, psoriasis, and a few other cutaneous affections. Externally, the oil is a very cheap and pretty useful counter-irritant, but requires great care and caution in its employment . . . . . . During the employment of the marking-nut, either externally or internally, the least appearance of a rash or redness of the skin, or an itchy or uneasy sensation in any part of the body, should be considered as a sign of the bad effects of the drug, and it should, therefore, be stopped immediately . . . . . In chronic and muscular forms of rheumatism, however, the marking-nut is not half as useful as it is in its acute variety, and I am therefore unable to speak much in its favour in the treatment of the former diseases . . . . . Marking-nut is also a good therapeutic agent in asthma, but the relief it affords in so small doses as those mentioned in some books, is very slight" (Moodeen Sheriff).

In the *Indian Medical Gazette* for March, 1902, Dr. Hem Chandra Sen, Teacher of Materia Medica, Campbell Medical School, Calcutta, published an interesting paper on the Therapeutics of the Marking-nut and the oil from it. According to him the drug is more or less useful in all the diseases for which it has been recommended.

I treated a patient admitted into the General Hospital for acute rheumatism affecting the large joints with the electuary of marking-nuts. He was discharged cured after having had the treatment for two weeks. In cases of chronic rheumatism in which it was given in the wards, the patients did not derive any benefit. I have not seen its efficacy in chronic complaints of the stomach, such as ulcer and chronic gastritis (Koman).

The ashes of the plant are prescribed in combination with other drugs for the treatment of snake-bite; the nut is similarly prescribed for scorpion-sting (Sushruta).

The ashes of the plant are not an antidote to snake venom (Mhaskar and Caius), and the nut is useless in the treatment of scorpion-sting (Caius and Mhaskar).

In India the chemical examination of the Marking-nut has been

carried out by Satyanarayananaidu (*Journ. Ind. Inst. Sc.*, 1928), and by Parameswarappillai and Siddiqui (*Journ. Ind. Chem. Soc.*; 1931).

In Madagascar the fruit is considered caustic and vesicant, and used in scrofula, venereal diseases, ainhum, rheumatism, leprosy and herpes.

Arabic: Beladin, Dahnulefaham, Habbulfahm, Habelkalb, Habulkalab—; *Assam:* Bholaguti—; *Bengal:* Bhela, Bhelatuki, Velama—; *Bombay:* Bhiba, Bhilama, Biba, Bilambi—; *Burma:* Che, Chyaibeng, Claybeng, Khisi—; *Canarese:* Agnimukhi, Bhallataka, Geru, Gerubija, Gerkayi, Goddugeru, Karigeru, Keru, Kerubija—; *Central Provinces:* Bhallia, Bhilawa, Koka—; *Deccan:* Belatak, Bhilavan—; *English:* Common Marking Nut Tree, Oriental Cashew Nut—; *French:* Anacardier d'Orient—; *Garo:* Bawarae—; *Gond:* Biba, Kohka—; *Gujerati:* Bhilamu—; *Hindi:* Belatak, Bhela, Bheyla, Bhilawa, Bilaran—; *Kadir:* Chambiri—; *Kolami:* Loso—; *Kumaon:* Bhilao, Bhilawa—; *Lambadi:* Balania—; *Lansdowne:* Bhalao—; *Lepcha:* Kongki, Sukung—; *Malayalam:* Chera, Cherkkuru, Cerkkotta, Kampira, Temprakku—; *Marathi:* Bibha, Bibu, Bibwa—; *Mundari:* Sosodaru—; *Nepal:* Bhalai, Bhalaiyo, Kalobhalayo—; *North-Western Provinces:* Bhala, Bhalian, Bhela, Bhilawa—; *Persian:* Biladur, Yaladara—; *Philippines:* Anagas—; *Punjab:* Bhela, Bhiladar, Bhilawa—; *Ranikhet:* Bhalao—; *Sakalave:* Abiba, Fanganga, Habiba, Mabiba, Mahabiba—; *Sanskrit:* Agnika, Agnimukhi, Anala, Antasatva, Arshohita, Arushkara, Avhala, Bhallataka, Bhalli, Bhallika, Bhutanashana, Bijapadapa, Dhanurvriksha, Krimighna, Kshatakshataru, Mahatikshna, Nirdahana, Prithakabija, Raktahara, Shailabija, Shophanuta, Shothahrita, Snehabija, Sphotabijaka, Sphotahetu, Tapana, Vanhi, Vanhinama, Vatari, Virataru, Vranakrita—; *Santal:* Soso—; *Saora:* Nallajidi, Shiddi—; *Sinhalese:* Kiribadulla—; *Spanish:* Anacardo—; *Swahili:* Koroso—; *Tamil:* Erimugi, Kalagam, Kavaga, Pallam, Pallikkai, Pudanashanam, Se, Sengottai, Seran, Serangottai, Sinduram, Sombalam, Tagilima, Tembarai, Vingi, Virasagi—; *Telugu:* Bhallataki, Bhallatamu, Gudova, Jidi, Nallajidi, Tummadamamidi—; *Tulu:* Gerkayi, Tere—; *Urdu:* Bhilanvana—; *Uriya:* Bhollatoki, Bhollia—.

HOLIGARNA Ham.

Lofty trees. Leaves alternate, simple, quite entire, coriaceous; petiole furnished with 2 or 4 spur-like deciduous appendages. Flowers small, crowded, in axillary and terminal racemes or panicles. Calyx superior; tube cup-shaped; teeth 5, imbricate. Petals 5, densely villous in front, cohering at the base and with the edge of the disk, persistent, valvate. Disk lining the calyx-tube, obscure in the female flowers. Stamens 5, inserted at the edge of the disk, coherent at the base with the petals; filaments subulate, glabrous; anthers small, subglobose. Ovary in the male flowers 0, in the female flowers inferior, 1-celled; ovule pendulous from near the top of the cell; styles 3-5, terminal; stigmas capitate or clavate. Drupe inferior, subcompressed, oblong or ovoid, resinous, acrid; stone coriaceous. Seed parietal; testa membranous; embryo thick; cotyledons plano-convex; radicle minute, next the hilum.—Species 5.—Indo-Malayan.

Leaves quite glabrous beneath
1. Leaves 15-23 cm. .... 1. *H. arnottiana.*
2. Leaves 30-60 cm. .... 2. *H. longifolia.*

This genus is therapeutically inert.

1. **Holigarna arnottiana** Hook. f. Fl. Brit. Ind. II (1876) 36.—*H. longifolia* W. & A. Prodr. 160 (non Roxb.); Bedd. Fl. Sylv. t. 167.—PLATE 280.

A tall tree; branches densely leafy at the apex. Leaves 15-30 by 5-10 cm., obovate or oblanceolate, decurrent into the petiole, acute or rounded at the apex, glabrous on both surfaces, paler beneath; main nerves 12-20 pairs, prominent on both surfaces, nearly straight, making a large angle with the costa; petioles 6-25 mm. long, with 2 petiolar spurs or tubercles at the top, which are early deciduous. Flowers minute, crowded, in rufous-tomentose panicles which are shorter or longer than the leaves. Calyx-teeth very short. Petals 2.5 mm. long, oblong, acute. Drupes reaching 2.5 cm. long, obliquely ovoid, rounded at the top, quite glabrous, long-pedicelled, almost entirely included in the torus.

Distribution: Evergreen forests of the western coasts and the W. Ghats, from the Konkan southwards, Coorg, Nilgiris, low country of Travancore.

The fruit and bark are employed medicinally (Beddome; Lisboa).

Bombay: Bibu, Hulgeri—; *Canarese:* Holageru, Holigar, Hulgeri, Kadugeru, Katugeri, Kuttegeru—; *Malayalam:* Chera, Cheru, Kattuchera—; *Marathi:* Holgeri—; *Tamil:* Karunjarai, Kattucheram, Kattucheru—.

2. **Holigarna longifolia** Roxb. Corom. Pl. III, 79, t. 282; Fl. Ind. II (1832) 80.

A tall tree, bark smooth, ash-coloured. Leaves 30-60 cm. long, very narrowly cuneate-oblanceolate acuminate, membranous, glabrous, glaucous beneath, ciliate when young, gradually narrowed from above the middle to the base which is hardly decurrent on the petiole; nerves 20-25 pairs, erect-patent, slender, reticulations large; petiole very short and thick, 6-25 mm. long; petiolar spurs 2 or 4, persistent or deciduous. Panicle very large and spreading, male one finely pubescent, female tomentose. Flowers dull white, rusty tomentose, 2.5 mm. across, clustered. Fruiting panicle with spreading decurved branches. Drupe entirely enclosed in the calyx-tube.

Distribution: Chittagong hill tribe, Lower Burma in Eng. and other forests.

The fruit and bark are employed medicinally (Morton).

The tree exudes a black, resinous, acrid, and poisonous juice from the trunk and rind of the fruit. The secretion is of a powerfully caustic nature and blisters the skin.

Bengal: Barola—; *Bombay:* Halugiri, Hulagiri—; Burma: Sheche—; *Canarese:* Kutugeri—; *Magahi:* Khreik—; *Marathi:* Sudrabibo—.

Spondias Linn.

Deciduous glabrous trees. Leaves usually crowded at the ends of the branches, alternate, imparipinnate; leaflets subopposite, usually caudate-acuminate. Flowers small, shortly pedicelled, polygamous, in terminal spreading panicles. Calyx small, deciduous, 4-5-fid; lobes slightly imbricate. Petals 4-5, spreading, subvalvate. Disk cup-shaped, broad, crenate. Stamens 8-10, inserted beneath the disk.

Ovary sessile, free, 4-5-celled; ovule 1 in each cell, pendulous; styles 4-5, conniving above. Drupe fleshy, stone hard, thick, 1-5-celled, the cells erect or diverging and opening by canals through the top of the stone. Seed pendulous; testa membranous; embryo straight; cotyledons elongate, plano-convex; radicle short, superior.—Species 6.—Tropics.

The genus exhibits astringent, antipyretic, and antidysenteric properties.

S. lutea Linn. is used medicinally in Guinea, *S. monbin* Linn. in the Gold Coast, *S. tuberosa* Arruda and *S. venulosa* Mart. in Brazil.

1. **Spondias pinnata** Kurz in Pegu Rep. A (1875) 44.—*Mangiferapinnata* Linn. f. Suppl. (1781) 156.—*Spondias Mangifera* Willd. Sp. Pl. II (1799) 751.—PLATE 281 (under *S. mongifera* Willd.).

A glabrous tree 9-10.5 m. high; trunk straight; bark smooth, ash-coloured; branches nearly horizontal. Leaves 30-45 cm. long, the common petioles slender, terete, smooth, striate; leaflets 3-5 pairs and a terminal one 7.5-18 by 3.8-7.5 cm. oblong or elliptic-oblong, acuminate, quite entire, more or less oblique; main nerves numerous, horizontal, straight, joined by a strong intramarginal one; petiolules 5-6 mm. long. Flowers 1- or 2- sexual, sessile, numerous, pinkish green, in sparingly branched glabrous terminal panicles 25-38 cm. long. Calyx-teeth minute, triangular. Petals 2.5-3 mm. long, ovate-oblong, acute. Disk 10-crenate. Stamens 10, about half as long as the petals. Drupes ovoid, yellow, about 3.8 cm. long; stone woody, hard, rough with irregular furrows and cavities, fibrous outside. Seeds usually 1, more rarely 2 or 3.

Distribution: Sub-Himalayan tract and outer valleys up to 3,000 ft., from the Chenab eastwards, Salt Range, Burma, Andamans, W. Peninsula, Ceylon.—Indian Archipelago, Hongkong.

The leaves are tasty, appetising, astringent.—The unripe fruit is sour, indigestible, hot; destroys " vata "; enriches the blood; cures rheumatism; good for sore throat.—The ripe fruit is acrid, sweet, oily, pleasant to the taste; indigestible, refrigerant, tonic, aphrodisiac,

astringent to the bowels; cures "vata", biliousness, ulcers, burning sensations, phthisis, blood complaints (Ayurveda).

The bark enters into the composition of a large number of prescriptions recommended for the treatment of snake-bite (Bapat).

The bark is a refrigerant medicine. It has been found useful in dysentery.

Among the Mundas the bark, ground and mixed with water, is rubbed on in both articular and muscular rheumatism. A handful of the bark is pounded and infused in a pint of water; after straining, this is drunk against diarrhœa or dysentery, either all in one draught, or half of it, the remainder being taken later (Encyclopædia mundarica).

The juice of the leaves is used for earache.

The fruit is a useful antiscorbutic. The pulp is acid and astringent, and is used in bilious dyspepsia.

The bark is not an antidote to snake-venom (Mhaskar and Caius).

Assam: Amara—; *Bengal:* Ambra, Amna, Amra—; *Bombay:* Amarah, Ambada, Ambara, Amra, Jangliam, Rhan-amb—; *Burma:* Grve, Kywae—; *Canarese:* Amate, Avatekayi, Ambate, Marahunise, Pundi, Vrykshamla—; *Deccan:* Jungliam, Ran-amb—; *English:* Bile Tree, Indian Hog Plum, Traveller's Delight, Wild Mango—; *Garo:* Adai, Tongrong—; *Gond:* Hamara—; *Hindi:* Amara, Ambodha, Ambra, Amra—; *Kadir:* Ambalam, Ambayam, Mampuli, Puliyilai—; *Khond:* Ambeti, Lima—; *Kolami:* Amburri—; *Konkani:* Ambaddo—; *Kumaon:* Amabara, Amara, Amra, Amur, Bahamb—; *Kurku:* Ambera—; *Lepcha:* Ronchilling—; *Malayalam:* Ampalam, Kattampalam, Mampuli, Pitanam, Pulimavu—; *Marathi:* Amb, Ambada, Ran-amba—; *Mundari:* Ambaru, Ambru, Amburu, Amru—; *Nepal:* Amara—; *Persian:* Darakhtemoryam—; *Portuguese:* Cajueiro—; *Punjab:* Ambara, Bahamb—; *Sanskrit:* Advagabhogya, Ambarataka, Ambarisha, Amlavataka, Amrata, Amrataka, Bhringiphalla, Kapichuda, Kapichuta, Kapipriya, Kapitana, Madhuramlaka, Markatamra, Pitana, Pitanaka, Rasadhya, Tanukshiri, Tungi, Varshapaki—; *Saora:* Ambada—; *Sinhalese:* Ambarella, Emberella—; *Tagalog:*

Alubihon—; *Tamil:* Ambalam, Ambiram, Egin, Eginam, Ibangam, Kattuma, Kattumagirangai, Malai, Mambulichi, Marima, Nalini, Pulima, Pullipullama, Sinsam, Sudam—; *Telugu:* Adavimamadi, Adavimamena, Ambalamu, Amratakamu, Ivurumamidi, Kondamamidi, Pita—; *Tulu:* Ambate—; *Uriya:* Ambula, Amboto, Amoda, Amratoko—; *Visayan:* Alubihod—.

CORIARIACEAE.

Glabrous shrubs, rarely annuals with angular twigs. Leaves opposite or ternate, simple, entire, exstipulate. Flowers small, green, hermaphrodite or polygamous, in axillary racemes. Sepals 5, imbricate, persistent. Petals 5, fleshy, keeled within, thickened and enlarged after flowering and embracing the fruit. Stamens 10, all free or 5 of them adnate to the petals; filaments short. Disk 0. Carpels 5-10, free, whorled on a fleshy receptacle; styles free, slender; ovules 1 in each cell. Fruit of 5 or 10 oblong compressed dry nuts; nuts 1-celled, 1-seeded.—Genus 1. Species 10.—Mediterranean to Japan, New Zealand, Chili to Mexico.

CORIARIA Niss ex. Linn.

Characters of family.

Astringent, narcotic, and poisonous properties.

In Europe *C. myrtifolia* Linn., and in New Zealand *C. sarmentosa* Forst. are used medicinally.

A powerful analeptic, coriamyrtin, has been isolated from the leaves and fruit of *C. myrtifolia* Linn.

1. **Coriaria nepalensis** Wall. Pl. As. Rar. III, t. 289.—PLATE 282.

A large deciduous or subdeciduous shrub up to 0.9 m. girth and 4.5 m. high. Bark dark grey or brown, very rough, more or less deeply cracked, exfoliating in small woody scales. Blaze 7.5-9 mm.,

somewhat fibrous, pale yellow, the juice turning purple on the blade of a knife. Branches smooth with prominent circular lenticels. Twigs quadrangular. Leaves 2.5-10 by 1.8-6.3 cm., opposite, subsessile, ovate or elliptic, abruptly short-acuminate, entire or very obscurely serrate, glabrous, 3-5-nerved. Flowers 5 mm. diam., in axillary, solitary or clustered racemes 2.5-10 cm. long. Pedicels 3.8-5 mm. long. Stamens red, with large anthers as long as the filaments. Styles red. Fruit 5-7.5 mm. diam., of 5 distinct nuts enclosed within the accrescent succulent petals, red at first, finally blue-black when ripe.

Distribution: Temperate and subtropical Himalaya from Murree, 3,000—6,000 ft., to Bhutan, ascending to 11,000 ft. in Sikkim.—Yunnan.

The leaves are used to adulterate senna, and act as a poison in large doses. The fruit is said to produce symptoms like tetanus.

Almora: Makab—; *Bias:* Armura, Pharpharchor, Ratsuhara—; *Chenab:* Baulu,, Shalu—; *English:* Mussoorie Berry—; *Garhwal:* Gogsa, Makala, Makhio, Makroli—; *Hindi:* Makola, Masuri—; *Jaunsar:* Gangaru, Gangeru, Mosroi—; *Jhelum:* Guch—; *Kashmir:* Balel, Tadrelu—; *Kumaon:* Ayar—; *Mussoorie:* Mansuri, Masuri—; *Naini Tal:* Makol—; *Nepal:* Bhojinsi—; *Ravi:* Kande, Rau, Shala—; *Simla:* Archarru, Pajerra, Raselwa—; *Sutlej:* Archalwa, Lichakhro, Shere—; *Tons Valley:* Gangara, Gangeru—.

MORINGACEAE.

Unarmed trees with soft wood. Leaves alternate, 2-3-pinnate, the pinnae and pinnules imparipinnate, opposite; leaflets opposite, quite entire, obovate, caducous, and, as well as the pinnae and pinnules, with glands at the base; stipules 0. Flowers large, white, or white streaked with red, hermaphrodite, irregular, in axillary pannicles. Calyx cup-shaped, 5-cleft; segments unequal, petaloid, deciduous from above the base, imbricate. Petals 5, unequal, the

upper smaller, the lateral ascending, the anterior the larger. Disk lining the calyx-tube. Stamens inserted on the edge of the disk, declinate, 5 perfect opposite the petals alternating with 5 (or 7) which are reduced to antherless filaments; anthers dorsifixed, 1-celled. Ovary stipitate; ovules numerous, in 2 series, on parietal placentas; style slender, tubular; stigma perforated. Capsule elongate, beaked, 3-6-angled, 1-celled, loculicidally 3-valved. Seeds many, in pits of the valves; testa corky, winged or not; albumen 0; embryo straight; cotyledons planoconvex; radicle very short, superior; plumule many-leaved.—Genus 1. Species 3.—Mediterranean, India.

MORINGA Lam.

Characters of the order.

1. Leaves usually 3-pinnate. Leaflets 13-20 mm. long. Nerves obscure. Flowers white .... 1. *M. oleifera.*
2. Leaves usually bipinnate. Leaflets 2.1-3.3 cm. long. Nerves distinct. Flowers yellow, streaked with red .... 2. *M. concanensis.*

M. oleifera Lam. is used medicinally in Guinea, La Reunion, Madagascar, and Guiana.

1. **Moringa oleifera** Lam. Encycl. I, 398.—*M. pterygosperma* Gaertn. Fruct. II (1791) 314; Wight Ill. t. 77.—PLATE 283 (under *M. pterygosperma* Gaertn.).

A small or middle sized tree; bark corky; wood soft; root pungent; young parts tomentose. Leaves usually 3-pinnate, sometimes 45 cm. long; rhachis slender, thickened and articulated at the base; pinnae and pinnules opposite, deciduous, their rhachides very slender, articulated and with a gland at the articulations; ultimate leaflets 12-20 by 6-10 mm., the lateral elliptic, the terminal obovate and slightly larger than the lateral ones; nerves obscure; petiolules of the lateral leaflets 1.5-2.5 mm., those of the terminal 3-6 mm. long. Flowers white, in large puberulous panicles. Calyx-lobes linear-lanceolate reflexed, puberulous outside. Petals spathulate, veined. Stamens 5 fertile, alternating with 5-7 antherless ones; filaments villous at the base. Ovary oblong, villous; style cylindric.

Pods reaching 45 cm. long, 9-ribbed. Seeds 3-angled, the angles winged.

Distribution: Indigenous in the sub-Himalayan tract from the Chenab to the Sarda, also in the Oudh Forests; cultivated throughout India and Burma.

The root-bark has a sharp taste, hot, sweet, occasionally bitter; digestible, astringent to the bowels, aphrodisiac, alexeteric, anthelmintic, analgesic; causes a burning sensation, biliousness; makes the blood impure; improves the appetite; useful in heart complaints, eye diseases, "kapha", "vata", all "tridosha" fevers, inflammation, dyspepsia, enlargement of the spleen, tuberculous glands in the neck, tumours, ulcers, earache, stuttering.—The bark removes all kinds of pains.—The leaves are tasty, cooling; remove all kinds of excessive pain; fattening, aphrodisiac, anthelmintic; useful in eye diseases "vata", biliousness; cure hallucinations, dry tumours, hiccough, asthma.—The flowers are hot; anthelmintic; cure inflammations, muscle diseases, "kapha", "vata", tumours, enlargement of the spleen.—The fruit is sweet, acrid, cures "kapha" and biliousness, pain, leucoderma, tumour.—The seed is hot; alexipharmac; cures eye diseases, head complaints, "vata"; causes "kapha". The oil is useful in leprous ulcers (Ayurveda).

The root is bitter; tonic to the body and the lungs; emmenagogue, laxative, expectorant, diuretic; enriches the blood; good for inflammations, the throat, chest wounds, bronchitis, piles, loss of appetite; cures stomatitis, gleet, urinary discharges, obstinate asthma, lumbago; sharpens the appetite; increases biliousness.—The flower—and to a lesser extent the leaf—is anthelmintic and expectorant; carminative; cures biliousness and bronchitis (Yunani).

The roots and the seeds are prescribed for the treatment of snake-bite (Charaka, Sushruta) and scorpion-sting (Sushruta).

A decoction of the root-bark is recommended to be given with asafœtida and rock salt in inflammation, abscess and calculous affections. The gum of the tree, mixed with sesamum oil, is recommended to be poured into the ears for the relief of otalgia.

Vaids prescribe the root as a stimulant in paralytic affections and intermittent fever; and they also employ it in epilepsy and

hysteria, and consider it a valuable rubefacient in palsy and chronic rheumatism.

The fruit is administered by Hakeems in affections of the liver and spleen, articular pains, tetanus, paralysis, etc. The root is used for soreness of the mouth and throat; and the gum for dental caries.

The oil of the seeds is used as an external application for rheumatism in Bengal.

In Bombay, a decoction of the root-bark is used as a fomentation to relieve spasm. In the Konkan the bark of the wild tree is ground with plumbago root, pigeon's dung and chicken's dung, and applied to destroy guinea-worms. Four tolas of the juice of the leaves of the cultivated tree are given as an emetic. The gum is said to be used to produce abortion.

The root and bark are abortifacient and used as such.

The fresh root is stimulant, carminative, stomachic and stimulant-diuretic; and the flowers also possess a slight stimulant property.

The seeds are used in venereal affections in Sind.

In Ceylon the acrid and pungent bark, leaves, and root are taken to promote digestion; they are used externally as a rubefacient.

In Ceylon the plant is a popular remedy for snake-bite. The bruised fresh leaves are applied to the wounds. The expressed juice of the fresh roots, bark, and leaves is poured into the nostrils in stupor and coma. The seeds are ground with water and applied to the eyes in coma. A decoction of the fresh roots and bark is given internally (Roberts).

In Ceylon the bruised fresh leaves are applied to the bites of monkeys and other animals (Roberts).

The immature capsules are used as a poison in Kelantan.

In Guinea the bark and the roots are considered rubefacient and they are used as vesicants. The ground roots are mixed with salt and applied as a poultice to tumours. The bark and the leaves ground together are applied to the head for neuralgia.

In French Guiana the root-bark is prescribed for hoarseness and soreness of the throat and in scurvy; it is rubefacient. The bark of the stem is used as an antiscorbutic. The leaves, pounded and

warmed, are applied to tumours as a resolvent. The fresh seed is considered antipyretic; it is acrid, bitter, and purgative.

I have found the root in the form of "compound spirit" very useful in fainting, giddiness, nervous debility, spasmodic affections of the bowels, hysteria and flatulence. The flowers are often resorted to as an aphrodisiac by the native medical practitioners in Southern India; but they have completely failed in my hands, though I have tried them in very large doses. They are at most a slight stimulant, but have not been found useful even as such in any particular disease. Applied externally in the form of a paste, the fresh root-bark and the bark act as a good vesicant and rubefacient. The former is much superior to the latter in this respect (Moodeen Sheriff).

All parts of the plant are useless in the treatment of snake-bite (Mhaskar and Caius) or scorpion-sting (Caius and Mhaskar) whether administered internally or applied externally.

The alkaloids from this plant closely resemble ephedrine in action. They are likely to be useful as a cardiac stimulant and in the treatment of such conditions as asthma (Chopra and De, 1930).

The seeds yield the "oil of ben" of commerce.

The oil from the seeds of a bitter variety growing in Kathiawar has been examined by Ramaswamiayyar and Parekh (18th Ind. Sc. Congress; Nagpur, 1931).

Later (1932) Chopra, and De conducted a series of experiments with the two alkaloids, moringine and moringinine, isolated from the root-bark. Neither of these gives the chemical and physical tests of ephedrine. Moringine was found to be comparatively inert; moringinine showed physiological activity. The latter (1) acts on the sympathetic nerve-endings as well as on the cardiac and smooth muscles all over the body; it produces a rise of blood-pressure, stimulation of heart and contraction of blood vessels; it also relaxes the bronchioles, inhibits the tone and movements of the intestines and contracts the uterus in guinea-pigs and rabbits; (2) it produces a slight diuresis due to rise of blood-pressure; (3) it is detoxicated by the liver; (4) it depresses the sympathetic motor fibres of the vessels in large doses only (*Ind. Journ. Med. Research;* October, 1932).

Almora: Sainjna—; *Bengal:* Sajina, Sajna, Sujuna—; *Bombay:* Mangai, Sanga, Saragoo, Segat, Sekto, Shegva, Sujna—; *Burma:* Daintha Dandalonbin, Danthalone—; *Canarese:* Guggala, Mochaka, Nugge—; *Chinese:* La Ken—; *Deccan:* Munga—; *English:* Drumstick Tree, Indian Horseradish—; *Ewe:* Babatsi, Yevuti, Yevutsi—; *French:* Bois néphrétigue, Moringe ă graine ailèe, Morughe—; *French Guiana:* Pois-coolie—; *Garhwal:* Sunara, Sundan—; *Goa:* Musing—; *Gobir:* Barambo—; *Gujarat:* Midhosaragavo, Saragavo, Segto, Seyla—; *Haldwani:* Sainjna—; *Hansot:* Sekto—; *Hausa:* Zogalagandi—; *Hindi:* Mungna, Sainjna, Saonjna, Segva, Shajna, Soanjna, Sondna—; *Hova:* Landihazobe—; *Indo China:* Chum ngay—; *Kolami:* Mulgia—; *Konkani:* Maissing, Moring, Moxing—; *Lansdowne:* Sunara, Sundan—; *La Reunion:* Mouroungue—; *Madagascar:* Morongo, Morongy—; *Malaya:* Gemunga—; *Malayalam:* Murinna, Sigru, Tishnagandha—; *Marathi:* Achajhada, Badadishing, Munagachajhada, Shevaga, Shevgi—; *Michi:* Mogna—; *Mundari:* Munga—; *North-Western Provinces:* Sahajna, Senjna, Sujna—; *Pampangan:* Calungai, Camalungue, Dool, Malungit, Malugit—; *Philippines:* Behen—; *Portuguese:* Moringueiro—; *Punjab:* Sanjna, Senjna, Soanjna—; *Sakalave:* Ananambo, Moringa—; *Sanskrit:* Akshiba, Bahumula, Chaksushya, Chalusha, Damsamula, Danshamula, Dravinanashana, Dvisigru, Gandhaka, Haritapatra, Haritashaka, Jalaproya, Janapriya, Kakshivaka, Kalibaka, Kaminisha, Katukanda, Komalpatraka, Krishnagandha, Krishnashigru, Kshamadansha, Madhugunjana, Madushigruka, Mechaka, Mocha, Mochaka, Mukhabhanga, Mukhamlda, Mulakaparni, Murangi, Rochana, Ruchiranjana, Sanamaka, Sanbhanjana, Shakapatra, Shigru, Shigruka, Shobhanjana, Shobhataka, Sitavhaya, Subhanjana, Sumula, Supatraka, Sutikshna, Strichittahari, Svetamaricha, Svetashigru, Tikshnamula, Tikshnandhaka, Tilashigru, Ugra, Ugragandhata, Upadansha, Vanapallava, Vidradhinashana—; *Santal:* Mungaarak—; *Sind:* Swanjera—; *Sinhalese:* Murunga—; *Sokoto:* Bagaruwar makka—; *Spanish:* Ben, Moringa—; *Swahili:* Mrongo, Mzunze—; *Tagalog:* Calugay, Calungai, Camalongay, Malungay—; *Tamil:* Achuram, Asasuram, Karunjanam, Kiranjanam, Kaykkirai, Kilavi, Murungai,

Sikkuru, Suligai, Tavuselam, Ugandan, Urudai—; *Telugu:* Mochakamu, Mulage, Sajana, Sigrupa, Sitavrykshamu, Tellamunaga—; *Tulu:* Nurge—; *Urdu:* Sahajna—; *Uriya:* Munika, Sojina, Sojoba—; *Visayan:* Balunggay, Calungai, Camalongay, Dool, Malungay, Malugit, Malungit—; *Wolof:* Nebredayi, Nevradayi—.

2. **Moringa concanensis** Nimmo in Grah. Cat. Bomb. (1839) 43.—Plate 284.

A tree, glabrous except the young parts and the inflorescence. Leaves 2- (very rarely 3-) pinnate, reaching 45 cm. long; primary pairs 5-6, distant, 10-20 cm. long, the primary rhachis thickened at the base and as well as the secondary articulated, and with a gland at the articulations; leaflets 4-6 pairs and an odd one, broadly elliptic or suborbicular, obtuse at both ends, often retuse at the apex, of variable size, sometimes 2-3.3 by 1.2-2.5 cm., pale beneath, articulated with a slender petiolule 2-8 mm. long; nerves 4-8 pairs, slender, distinct. Flowers in lax divaricate thinly pubescent panicles reaching 45 cm. long; pedicels 8-12 mm. long, articulated with the flower; bracts minute, caducous. Calyx thinly tomentose, about 8-12 mm. long; segments white, oblong, reflexed. Petals yellow, veined with red, oblong or oblong-spathulate, the lower about 1.5 cm. long. Stamens 5 fertile, and 4-5 staminodes; filaments hairy at the base. Capsules straight, acutely triquetrous, slightly constricted between the seeds 30-45 cm. long; valves hard, 1.2-1.7 cm. broad. Seeds white or pale yellow, 3-angled, 1.7-1.9 cm. long, 3-winged; wings very thin, hyaline.

Distribution: Baluchistan, Sind, Rajputana, dry hills of the Konkan, Berar, N. Circars and Deccan, from Vizagapatam to Guntur, Kurnool and Coimbatore.

The general properties are the same as those of *M. oleifera;* powerful tonic; sweet, alterative, stomachic, laxative; good in inflammations, " vata ", biliousness, asthma (Ayurveda).

The roots are used as a substitute for those of *M. oleifera.*

Bombay: Sainjna—; *Hindi:* Sajana—; *Marathi:* Muwa, Ranshegat, Sajana—; *Porebunder:* Dungaransaragavo, Kadvosaragavo—; *Rajputana:* Hegu, Sainjna, Segora, Segu, Sunjna—;

Sanskrit: Bahulada, Garbhapataka, Kesari, Krishnabija, Madhushigru, Mrigari, Raktaka, Raktashigru, Shubhanjana, Sinha, Sugandha, Surangi, Svetashigru, Tiktashigru—; *Sind:* Mhua Muah—; *Tamil:* Kattumurungai—; *Telugu:* Adavimunaga, Karumunaga, Kondamunaga—.

CONNARACEAE.

Trees or shrubs erect or scandent. Leaves alternate, exstipulate, 1-3-foliolate or imparipinnate; leaflets quite entire. Flowers usually hermaphrodite, racemose or paniculate, regular or subregular. Calyx 5- lobed or -partite, usually persistent, imbricate or valvate. Petals 5, usually narrow, free or slightly cohering, very rarely valvate. Stamens perigynous or hypogynous, sometimes declinate, 5 or 10, those opposite the petals usually shorter and often imperfect; filaments filiform, often connate at the base. Disk 0 or small, annular or incomplete. Carpels 5, rarely 1-3 or 6-7, globose-ovoid, hirsute, 1-celled; ovules 2, collateral, ascending, orthotropous; styles subulate or filiform; stigmas capitellate, simple or 2-lobed. Fruit usually of 1 (rarely 2-3), sessile or stalked 1- (rarely 2-) seeded follicles. Seed erect, often arillate; testa thick, sometimes arilliform below the middle, the aril various, cotyledons fleshy in the exalbuminous, leafy in the albuminous seeds; radicle superior, rarely ventral.—Genera 16. Species 160.—Tropics.

1. Calyx enlarged after flowering. Follicles sessile .... ROUREA.
2. Calyx not enlarged after flowering. Follicles stipitate .... CONNARUS.

The order is therapeutically inert.

ROUREA Aubl.

Trees or shrubs sometimes scandent. Leaves imparipinnate; leaflets opposite or alternate. Flowers small, numerous, in axillary

panicles; pedicels usually slender. Sepals 5, broadly ovate or orbicular, imbricate, enlarged and clasping the base of the ripe follicle. Petals 5, usually linear-oblong. Stamens 10; filaments connate at the base. Ovaries 5, of which 4 are usually imperfect; styles slender. Follicle sessile, curved. Seed erect, arillate, exalbuminous.—Species 40.—Tropics.

The genus is therapeutically inert.

1. **Rourea santaloides** Wight & Arn. Prodr. (1834) 144.—PLATE 285.

A climbing or sarmentose shrub; branches slender. Leaflets 2-4 pairs and a terminal one, 3.8-9 by 2-3.8 cm., coriaceous, elliptic or lanceolate, caudate-acuminate, shining above, prominently reticulately veined beneath, base rounded, less commonly acute; petioles 3-12 mm. long. Flowers small, in glabrous racemose panicles, several of which spring from leaf-axils; pedicels short, slender; bracts minute. Sepals 2.5 mm. long, broadly ovate or suborbicular, more or less minutely ciliolate. Petals 4-5 mm. long, spathulate-oblong. Ovaries ovoid, glabrous; styles shorter than the stamens; stigmas 2-lobed. Follicles 2 cm. long, conical-ovoid, tapering to a point, falcately curved, chestnut--brown, finely striate, supported on the enlarged calyx, dehiscing ventrally. Seeds about 1 cm. long, ovoid-oblong, arillate.

Distribution: Konkan, S. M. Country, N. Kanara to Travancore.

The root is bitter, pungent, acrid; alterative, tonic, laxative, appetiser, aphrodisiac; cures "kapha" and "vata", bronchitis, dyspepsia, anæmias, tuberculosis, urinary discharges, inflammations, pains in the joints (Ayurveda).

The root is used as a bitter tonic in rheumatism, scurvy, diabetes, and pulmonary complaints; also as an alterative and tonic in syphilis; externally it is applied to ulcers and other skin affections.

Bengal: Vidhadaka, Vitaraka—; *Bombay:* Vardara—; *Canarese:* Eradumushte, Huleshadlaballi—; *Gujerati:* Varadharo—; *Hindi:* Kalavidhara, Vidhara—; *Marathi:* Vardara, Wakeri—; *Sanskrit:* Ajantri, Antri, Avegi, Chhagala, Chhagalantrika, Dirghavallari, Dirghavalluka, Jantuka, Junga, Kotarapushpi,

Rukshagandha, Rushyachhagalanghri, Shyama, Vridha, Vridhadaruka, Vrishyagandha—; *Sinhalese:* Kerindivel—; *Telugu:* Chandrapudi—.

CONNARUS Linn.

Trees or shrubs often scandent. Leaves imparipinnate; leaflets usually 5, quite entire. Flowers small, in axillary and terminal branched panicles. Sepals 5, not enlarged after flowering, imbricate, embracing the pedicel of the fruit. Petals 5, linear or ligulate, slightly dilated upwards. Stamens 10, those opposite the sepals long, with perfect anthers, those opposite the petals shorter and sometimes antherless. Ovaries 5, densely pubescent, 4 usually imperfect or obsolete, the fifth with a slender style; stigma capitellate. Follicle oblique, stipitate, inflated, glabrous or pubescent within. Seed arillate; testa shining; albumen 0; cotyledons amygdaloid.—Species 70.—Tropical America, Africa, Asia.

The genus is not defined therapeutically.

1. **Connarus monocarpus** Linn. Sp. Pl. (1753) 675.

A much-branched shrub. Leaflets 1 or 2 pairs with a terminal one, 7.5-10 by 3.2-4.5 cm., glabrous, shining, elliptic or elliptic-lanceolate, obtusely acuminate, rounded or acute at the base; nerves 3-5 pairs; petiolules of the lateral leaflets 3-6 mm., those of the terminal leaflets longer. Flowers about 6 mm. long, crowded, in erect pyramidal densely pubescent terminal panicles; pedicels short, stout, articulated with the flower. Sepals ovate-oblong, subacute, densely pubescent. Petals much longer than the calyx, linear-oblong, more or less pubescent outside. Follicles glabrous within, at first bright scarlet, afterwards dark brown outside, 3.8-5.7 cm. long, fusiform, slightly falcate, tapering into a narrow stalk surrounded at the base by the persistent (non-accrescent) calyx, smooth, not striate nor shining. Seeds 2.5 cm. long, ovoid, slightly compressed, surrounded at the base by a large pulpy yellow aril; testa black, shining.

Distribution: From the Konkan to Travancore, Ceylon.

A decoction of the root is given in syphilis.

The pulp of the fruit is used in diseases of the eye.

Bombay: Sunder—; *Burma:* Atkalet, Kadatkalet, Talete—; *Canarese:* Tolage—; *Ceylon:* Chettupulukodi—; *Malayalam:* Kurila—; *Sinhalese:* Kadaliya—; *Tamil:* Sedippulikkodi—.

PAPILIONACEAE.

Herbs, shrubs or trees. Leaves alternate, digitate or pinnate, rarely 1-foliolate or simple, often terminating in tendrils. Flowers irregular (rarely subregular), hermaphrodite. Calyx gamosepalous, 5- toothed or -lobed or the upper lobes more or less connate, or bilabiate, the 2 upper lobes opposed to the 3 lower, rarely closed in bud and spathaceous. Corolla papilionaceous; petals 5, free or adnate to the staminal tube, the posterior (standard) outside in bud, the 2 lateral (wings) intermediate, the 2 lower inside and usually cohering by their lower margins (keel). Stamens 10, diadelphous, monadelphous or free. Ovary free. Embryo with an inflexed radicle. Cotyledons accumbent.—Distributed throughout the world.

A. Stamens monadelphous. Pod dehiscent, not jointed. Leaves simple or digitately trifoliolate
 Pod turgid .... CROTALARIA.

B. Stamens diadelphous. Pod usually dehiscent, not jointed
 Leaves pinnately trifoliolate
 a. Pod elongated, straight or recurved .... TRIGONELLA.
 b. Pod short, round or oblong .... MELILOTUS.

C. Stamens usually diadelphous. Pod dehiscent not jointed. Leaves imparipinnate. Leaflets entire
 I. Anthers apiculate; hairs fixed by the centre
 a. Stamen monadelphous .... CYAMOPSIS.
 b. Stamens diadelphous .... INDIGOFERA.
 II. Anthers obtuse; hairs basifixed
 a. Pod 1-seeded, indehiscent. Leaves gland-dotted .... PSORALEA.
 b. Pod few- or many- seeded, subindehiscent or late in dehiscing
 1. Filaments filiform
 * Pod membranous, inflated .... COLUTEA.
 ** Pod woody or very firm .... MILLETTIA.
 *** Pod egg-shaped, dehiscent .... ADINOBOTRYS.

2. Filaments dilated .... MUNDULEA.
c. Pod many-seeded, soon dehiscing
1. Flowers mostly in leaf-opposed racemes .... TEPHROSIA.
2. Flowers mostly in axillary racemes. Pod very long, distinctly septate .... SESBANIA.
Pod linear, coriaceous, not septate
o. Keel dipetalous, acute .... GLYCYRRHIZA.
oo. Keel long, obtuse .... ASTRAGALUS.

D. Stamens diadelphous or monadelphous. Pod jointed if more than 1-seeded. Leaves odd-pinnate
I. Leaves exstipellate
a. Stamens monadelphous. Anthers uniform
Leaflets 1-3. Flowers in a lax raceme .... TAVERNIERA.
b. Stamens diadelphous. Anthers uniform
Spiny shrub with simple leaves .... ALHAGI.
c. Stamens monadelphous. Anthers dimorphous
Joints of pod 2-6, muricated .... ZORNIA.
d. Stamens in 2 bundles of 5 each. Anthers uniform
1. Pod twisted inside the calyx .... SMITHIA.
2. Pod straight, exserted from the calyx
Calyx 5-toothed .... OSMOCARPUM.
II. Leaves stipellate
a. Ovules several. Pod not distinctly jointed
Pod flat .... PSEUDARTHRIA.
b. Ovules 2 or more. Pod distinctly jointed
1. Pod twisted up so that the joints are brought face to face. Calyx not accrescent. Teeth setaceous .... URARIA.
2. Pod not twisted up; joints turgid .... ALYSICARPUS.
* Pedicel not inflexed. Racemes in fascicles from the old wood .... OUGEINIA.
** Pedicel not inflexed. Racemes simple or panicled from the year's shoots .... DESMODIUM.
*** Flowers crowded in short axillary spikes or pedicelled in the axils of the leaves .... ARACHIS.

E. Stamens diadelphous. Pod dehiscent, not jointed. Leaves equally pinnate. Petiole ending in a tendril or a bristle
I. Shrubs with the 10th stamen absent .... ABRUS.
II. Herbs with diadelphous stamens
a. Leaflets toothed .... CICER.
b. Leaflets entire
1. Tube of stamens oblique at mouth. Ovary nearly sessile, 2- or many- ovuled .... VICIA.
2. Tube of stamens oblique at mouth. Ovary subsessile, 2-ovuled .... LENS.
3. Tube of stamens truncate at mouth................ LATHYRUS.
III. Distinguished from LATHYRUS by its thick laterally compressed style .... PISUM.

F. Stamens monadelphous or diadelphous. Pod dehiscent, not jointed. Climbing, rarely erect herbs or shrubs with pinnately trifoliolate leaves

I. Leaves not gland-dotted. Leaflets stipellate. Nodes of racemes not tumid. Flowers small. Petals about equal in length. Style beardless
   Stamens monadelphous. Stipules and bracts minute, caducous
      1. Anthers uniform, all fertile .... GLYCINE.
      2. Alternate anthers abortive .... TERAMNUS.
II. Leaves not gland-dotted. Leaflets stipellate. Nodes of racemes tumid. Flowers conspicuous. Petals very unequal
   a. Keel exceeding the wings and standard
      Anthers dimorphous .... MUCUNA.
   b. Standard exceeding the keel and wings .... ERYTHRINA.
III. Leaves not gland-dotted. Leaflets stipellate. Nodes of racemes tumid. Petals equal. Style beardless
   a. Stamens diadelphous
      Shrubs. Flowers large, racemose .... BUTEA.
   b. Stamens monadelphous
      1. Upper lip of calyx projecting .... CANAVALIA.
      2. Upper teeth of calyx not projecting
         Pod linear, flat, many-seeded .... PUERARIA.
IV. Leaves not gland-dotted. Stamens diadelphous. Style bearded below the stigma
   a. Stigma oblique
      1. Keel spiral .... PHASEOLUS.
      2. Keel not spiral. Style filiform .... VIGNA.
   b. Stigma terminal
      1. Petals very unequal in length .... CLITORIA.
      2. Petals equal in length .... DOLICHOS.
V. Leaves gland-dotted below. Stipellate often abortive. Nodes of raceme not tumid. Styles not bearded
   a. Ovules 3 or more
      1. Pod with depressed lines between each seed. Seeds with a large grooved aril .... ATYLOSIA.
      2. Aril absent .... CAJANUS.
   b. Ovules 1-2
      1. Calyx-teeth accrescent .... CYLISTA.
      2. Calyx-teeth not accrescent
         * Leaves pinnate. Pod compressed .... RHYNCHOSIA.
         ** Leaves digitate. Pod turgid .... FLEMINGIA.

G. Stamens monadelphous or diadelphous. Pod continuous, indehiscent. Leaves odd-pinnate
   I. Leaflets distinctly alternate
      a. Flowers small, white or reddish .... DALBERGIA.
      b. Flowers large, yellow .... PTEROCARPUS.
   II. Leaflets opposite
      a. Pod flat, almost woody, wingless .... PONGAMIA.
      b. Pod flat, thin, firm, winged down one or both sutures .... DERRIS.

H. Stamens free. Pod not jointed. Leaves odd-pinnate, rarely simple
   Pod moniliform .... SOPHORA.

This is an extremely important family, as from its members are obtained nutritious foods, valuable medicines, and virulent poisons.

The members exhibit most varied properties: some are amylaceous, other oleaginous; many yield resins, balsams, and dyes; not a few are astringent, acrid and bitter, narcotic and poisonous, emetic and purging, tonic and restorative; the seeds are often antiperiodic, the roots anthelmintic.

The following are among the products which have been obtained:—(1) alcohols—methyl, ethyl—; (2) aldehydes—benzoic—; (3) acids—abric, arachidic, coluteic, coumaric, citric, chrysophanic, ellagic, gallic, hydrocyanic, hypogæic, illuric, kinotannic, lignoceric, linoleic, malic, oleic, oxalic, salicylic, tannic—; (4) esters—methyl salicylate—; (5) amino-acids and allied substances—betaine, choline—; (6) carbohydrates—glucose, lævulose, invert sugar, mannogalactans—; (7) saccharine substances—manna—; (8) fixed oils—arachis, soya—; (9) anthraquinone derivatives—emodin, rhein—; (10) gums—gum kino, tragacanth—; (11) tannins—; (12) glucosides—amygdalin, campferitin, cyanomaclurin, galuteolin, glycyrrhizin, incarnatrin, indican, kæmferin, linamarin, lotusin, melilotoside, phaseolunatin, robinin, robinoside, robitin, rutin, ulexoside, vernin, vicianin, vistarin—; (13) alkaloids—arachine, cytisine, convicine, erythrocoralloidine, erythrophleine, eseramine, eseridine, galegine, geneserine, genisteine, hydroxylupanine, hypaphorine, isophysostigmine, lupanine, lupinine, matrine, N-methyltyrosine, physostigmine, physovenine, retamine, sarothamnine, sparteine, trigonelline, vicine—; (14) albumotoxins—abrin—; (15) dyes—achrosin, flemingin, indigotin, quercetin, santalin—; (16) phenols—catechol—.

OFFICIAL:—Eserine salicylate (France, Spain);—sulphate (Spain).

Physostigmine salicylate (Austria, Belgium, Denmark, Germany, Great Britain, Holland, Hungary, Italy, Japan, Russia, Sweden, Switzerland, Turkey, United States);—sulphate (Germany, Holland, Japan, Turkey).

Sparteine sulphate (Belgium, France, Italy, Spain, Switzerland, Turkey, United States).

Abrus precatorius Linn. (Holland).

Andira Araroba Aguiar (Austria, Belgium, Denmark, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland).

Arachis hypogaea Linn. (Germany, Great Britain, Japan, Switzerland); *A. hypogaea* Linn.=*A. asiatica* Lour. and *A. africana* Lour. (Portugal).

Astragalus spp. (Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Russia, Spain, Sweden, Switzerland, Turkey, United States); *A. gummifer* Labill. (Belgium, France, Great Britain, Spain, United States); *A. Poterium* Vahl. (Portugal); *A. verus* Oliv. (Portugal); *A. ascendens* Boiss., *A. brachycalix* Fischer (Spain); *A. adscendens* Boiss. (Italy).

Dolichos pruriens Linn.=*Mucuna pruriens* De Cand., *D. urens* Linn.=*M. urens* De Cand. in Portugal.

Glycine soja Siebold & Zuccarini (Sweden).

Glycyrrhiza spp. (Great Britain); *G. glabra* Linn. (Austria, France, Germany, Great Britain, Holland, Italy, Spain, Turkey, United States); *G. glabra* var. *glandulifera* Waldst. & Kit. (Holland, Spain); *G. glabra* Linn. var. *glandulifera* Regel & Herder (Austria, Denmark, Hungary, Japan, Norway, Russia, Sweden, Switzerland, United States)=*G. glandulifera* K. (Russia); *G. glabra* var. *typica* Regel & Herder (Belgium, United States); *G. glabra* Linn.=*Liquiritia officinalis* Moench. (Portugal); *G. uralensis* Fisch. (Russia).

Melilotus altissimus Thuillier (Germany); *M. dentatus* Pers., *M. hirsutus* Lipsky (Russia); *M. officinalis* Desr. (Austria, Russia); *M. officinalis* (Linne) Desrousseaux (Germany).

Myroxylon balsamum var. *Pereirae* H. Bn. (Belgium); *M. balsamum* Harms var. *Pereirae* Baillon (Sweden); *M. balsamum* (Linne) Harms var. *Pereirae* (Royle) Baillon (Germany, Russia, Turkey); *M. balsamum* Harms *a-genuinum* Baillon (Sweden); *M. balsamum* (Linne) Harms var. *genuinum* Baillon (Germany, Turkey); *M. Pereirae* Klotzsch (Holland, Hungary, Italy, Japan,

Norway); *M. Pereirae* (Royle) Klotzsch (Great Britain); *M. Pereirae* Klotzsch=*Myrospermum Pereirae* Royle (Portugal, Spain); *M. peruiferum* Linn. fil.=*Myrospermum peruiferum* De Cand. (Portugal); *M. toluifera* Humb., Bonpl. & Kunth. (Belgium); *M. toluifera* Humboldt, Kunth. (Norway); *M. toluifera* Klotzsch (Hungary); *M. toluifera* H. B. K.=*Myrospermum toluifera* A. Rich, *Toluifera Balsamum* Linn. (Spain)=*Myrospermum toluiferum* Rich. (Portugal); *M. toluiferum* H. Baillon (Italy); *M. toluiferum* H. B. K. (Great Britain, Holland, Japan).

Ononis spinosa Linn. (Germany, Hungary, Switzerland).

Physostigma venenosum Balfour (Great Britain, Japan, Portugal, United States).

Pterocarpus Draco Linn.=*P. officinalis* Jacq. (Portugal); *P. indicus* Willd.=*P. Draco* Lamk. non Linn. (Portugal); *P. Marsupium* Roxb. (Portugal, Switzerland, United States); *P. santalinus* Linne filius (Austria, Sweden, United States),—Linn. (Holland).

Pueraria hirsuta Matsum. (Japan).

Spartium scoparium Linn.=*Cytisus scoparius* Link. (Portugal).

Toluifera Balsamum Linn. (Austria, France, Hungary, Switzerland, United States)=*Myroxylon Toluifera* Klotzsch (Hungary); *T. Balsamum* Miller (Denmark); *T. Pereirae* Baillon (Austria, Denmark); *T. Pereirae* H. Bn. (France); *T. Pereirae* (Klotzsch) Baillon (Hungary, Switzerland)=*Myroxylon Pereirae* Klotzsch (Hungary); *T. Pereirae* (Royle) Baillon (United States).

Trifolium Melilotus officinalis Linn.=*Melilotus officinalis* Lamk. & *M. vulgaris* Willd. (Portugal).

Trigonella Foenum graecum Linn. (Austria, Germany, Portugal, Switzerland).

Vouacapoua Araroba (Aguiar) Druce (United States).

Crotalaria Dill. ex Linn.

Herbs or shrubs, or more or less herbaceous undershrubs. Leaves simple or trifoliolate or sometimes 5-7-digitate; with or without stipules, the stipules sometimes decurrent in wings on the branches.

Flowers in terminal or leaf-opposed racemes, rarely solitary, usually yellow but sometimes blue, often large and showy. Calyx-tube short; lobes linear or lanceolate, subequal or more or less connate in 2 lips. Corolla equal to or exceeding the calyx; standard with a short claw and callus above it, usually orbicular or ovate; wings obovate or oblong, shorter than the standard, clawed and usually with minute transverse folds; keel as long as the wings, its petals connate, much incurved, beaked. Stamens monadelphous, connate in a sheath cleft above; anther dimorphous, alternately short versatile with slender filaments and long basifixed with flattened filaments. Ovary sessile or stalked, 2-many-ovuled; style long, abruptly incurved at the base, bearded upwards; stigma small, oblique. Pod sessile or stalked, usually globose or oblong, turgid or inflated, continuous within. Seeds usually many, rarely 1 or 2, without strophiole; funicle filiform.—Species 350.—Tropics and subtropics.

A. Leaves simple
- I. Rigid, copiously stiffly branched young shrub with small exstipulate deciduous leaves. Pod slightly longer than the calyx, pubescent .... 1. *C. burhia.*
- II. Diffuse herbs. Stems prostrate or ascending. Racemes all lateral, few-flowered
  - Stipules absent. Corolla not exserted. Bracts minute, subulate .... 2. *C. prostrata.*
- III. Diffuse annuals or low shrubs with slender branches. Racemes all terminal or a few also lateral
  - Pod distinctly exserted. Racemes lax. Stipules absent. Plant exceeding 30 cm. in height .... 3. *C. albida.*
- IV. Erect herbs of shrubs. Racemes usually terminal. Pod glabrous, much longer than the calyx
  - a. Stipules and bracts subulate .... 8. *C. retusa.*
  - b. Stipules and bracts foliaceous .... 9. *C. sericea.*
- V. Erect shrubs. Leaves usually large, not deciduous. Flowers in terminal or terminal and lateral racemes
  - a. Branches angled
    - Stipules foliaceous. Corolla blue and white ...... 4. *C. verrucosa.*
  - b. Branches terete
    - Stipules absent or minute. Wings of corolla yellow .... 5. *C. juncea.*

B. Leaves trifoliolate
- I. Calyx-teeth exceeding the tube. Pod subglobose .... 6. *C. medicaginea.*
- II. Calyx-teeth twice the length of the tube. Pod subquadrangular .... 7. *C. trifoliastrum.*

C. goreensis Guill. and Perr. is used medicinally in the Gold Coast, *C. atrorubens* Hochst. in Nigeria, *C.burkeana* Benth. in Rhodesia, *C. spinosa* Hochst. in Madagascar.

1. **Crotalaria burhia** Ham. in Wall. Cat. (1828) n. 5386. —PLATE 286A.

A low shrub or undershrub with stiff sometimes spinescent erect and spreading often tangled branches 30-60 cm. high. Twigs often leafless or nearly so, striate and densely pubescent. Leaves few, deciduous, simple, 5-25 mm. long, oblong, entire, subsessile, clothed on both sides with adpressed silky hairs, margin thickened, lateral veins obscure; stipules 0. Flowers about 6-12, in elongated terminal racemes; pedicels very short, 2-bracteolate. Calyx 7.5 mm. long, densely hairy, teeth lanceolate. Corolla yellow, scarcely exceeding the calyx. Pod scarcely longer than the calyx, hairy, 3-4-seeded.

Distribution: Sind, Baluchistan, Punjab, Upper Gangetic Plain, Rajputana, Cambay, Gujarat.—Afghanistan, Persian Baluchistan.

The branches and leaves are used as a cooling medicine (Stewart).

Bombay: Sis, Sissai—; *Gujerati:* Ghugharo—; *Marathi:* Ghagari—; *Ormara:* Tambo—; *Punjab:* Bhata, Bui, Buta, Kauriala, Kharsan, Khep, Khif, Khip, Khippi, Lathia, Meini, Polo, Sis, Sissai—; *Sind:* Drunnu—.

2. **Crotalaria prostrata** Rottl. in Willd. Enum. Hort. Berol. (1809) 747; Roxb. Hort. Beng. (1814) 54.—PLATE 287.

Annual, 15-38 cm. high; branches many, ascending, slender, clothed with silky yellowish hairs. Leaves subsessile, 2-3.8 by 1-2 cm., oblong or oblong-obovate, rounded at the apex, clothed on both surfaces with silky yellowish or yellowish brown hairs, paler beneath, usually oblique or subcordate at the base; stipules 0. Flowers small, pedicelled, in 2-4-flowered racemes; peduncles slender, hairy, longer than the leaves; bracts and bracteoles minute, subulate. Calyx 3-4 cm. long, densely hairy; segments linear. Corolla yellow, not exserted; standard broadly oblong, 2 mm. in breadth. Pods 1.2-1.5 mm. long, inflated, glabrous. Seeds 12-15, highly polished.

Distribution: Drier parts of India, Ceylon. Burma.—Java.

The Santals use the root in derangements of the stomach.

Among the Mundas the root is used medicinally for stomach-ache, and diarrhœa, especially infantile diarrhœa.

Bengal: Chotojhunghyn—; *Mundari:* Cutulutur, Narisökoe—; *Santal:* Khatic jhunka, Nanhajhunka—; *Telugu:* Serigallygista—.

3. **Crotalaria albida** Heyne ex Roth Nov. Pl. Sp. (1821) 333. —*C. montana* Roxb. Fl. Ind. III (1832) 265.—PLATE 286B.

A much-branched undershrub 30-60 cm. high; branches slender, terete, more or less silky-pubescent. Leaves 2.5-5 by 0.45-1.2 cm., linear-oblong or oblanceolate, obtuse, apiculate, pellucido-punctate, more or less silky-pubescent (especially beneath), base acute; petioles 1.5-2.5 mm. long; stipules 0. Flowers in terminal (rarely lateral) 6-20-flowered racemes, 5-12.5 cm. long; pedicels 3-5 mm. long; bracts and bracteoles linear. Calyx 6 mm. (finally 1 cm.) long; teeth long, the 3 lower linear, acuminate, the 2 upper broader, sometimes sub-obtuse. Corolla 8 mm. long, pale yellow; standard suborbicular, with a few hairs on the back; wings obovate-oblong. Pods glabrous, sessile, 1.2-1.6 cm. long, oblong-cylindric. Seeds 6-12.

Distribution: Hotter parts of India, Ceylon, Burma, Malay Peninsula and Archipelago to China and the Philippines.

The root is used as a purgative.

Hindi: Banmethi—; *Malay:* Poko gigeling jantan, Poko gingiling jantan—; *Mundari:* Huring pirisokoe—; *Telugu:* Kondagiligichcha—.

4. **Crotalaria verrucosa** Linn. Sp. Pl. (1753) 715; Bot. Mag. t. 3034; Wight Ic. t. 200.—PLATE 288A.

A much-branched herb 0.6-0.9 m. high; branches acutely angled, at first puberulous, afterwards glabrescent. Leaves 5-15 by 3-7.5 cm., ovate-rhomboid or ovate-deltoid, obtuse or occasionally acute at the apex, tapering to the base, subglabrous above, more or less downy and paler beneath; nerves prominent; petioles 2.5-4 mm.; stipules large, foliaceous, semilunate, persistent. Flowers in terminal or lateral 12-20-flowered racemes 15-20 cm. long; pedicels 4.5 mm. long; bracts at the base of the pedicels linear-lanceolate, 3 mm. long, those on the pedicels much smaller, subulate. Calyx membranous,

8 mm. long, faintly pubescent; tube short, campanulate; teeth subequal, triangular, acute. Corolla 2 cm. long, exserted, bluish purple and white, rarely entirely white. Pods densely villous when young, softly pubescent when ripe, 2.5-3.8 cm. long, oblong-cylindric, stalked. Seeds 10-15, yellow, 5 mm. long, polished.

Distribution: India generally, Ceylon, Malay Peninsula and Archipelago, China, N. Australia, tropical Africa.

The leaves are hot, sharp, bitter; expectorant; emetic; cure "kapha", biliousness, dyspepsia, fever, blood impurities, throat and mouth diseases, heart complaints (Ayurveda).

The juice of its leaves is used in medicine; it is supposed to be efficacious in diminishing salivation. It is prescribed by the Tamil doctors, both internally and externally, in cases of scabies and impetigo.

Bengal: Bansan, Jhanjhana—; *Bombay:* Tirat—; *Ceylon:* Kilukiluppai—; *Hindi:* Banshana, Jhunjhunia—; *Konkani:* Khulakhula—; *La Reunion:* Cascavelle bleue—; *Marathi:* Ghagari—; *Sanskrit:* Brihatapushpi, Dhavani, Shanapushpi—; *Sinhalese:* Nilandanahiriya—; *Tagalog:* Bulailava—; *Telugu:* Ghelegherinta—.

5. **Crotalaria juncea** Linn. Sp. Pl. (1753) 714.—Plate 288B.

Annual, 0.6-2.4 m. high; branches numerous, ascending, slender, terete, striate, silky-pubescent. Leaves 2.5-10 by 0.6-2 cm., linear or oblong, obtuse or subacute, apiculate, clothed on both sides with appressed silky shining hairs, base usually acute; petioles 1.25-2.5 mm. long; stipules 0 or very minute. Flowers large, in erect terminal and lateral 12-20-flowered racemes often reaching 30 cm. long; pedicels 3-6 mm. long, pubescent; bracts minute, linear-subulate; bracteoles 2 beneath the calyx, minute, linear-subulate. Calyx 2 cm. long, clothed with fulvous hairs; teeth linear-lanceolate, very deep. Corolla bright yellow, slightly exserted; standard ovate-oblong, subacute. Pods 2.5-3 cm. long, sessile, clothed with short fulvous silky hair. Seeds 10-15.

Distribution: Cultivated throughout India from the base of the Himalaya to Ceylon, and in the E. tropics generally.

The leaves are hot, sharp, sour, bitter, acrid; emetic, laxative, abortifacient, analgesic; remove "vata" and "kapha".—The flowers cure leucorrhœa, and blood diseases.—The seeds are cooling, astringent, indigestible, emmenagogue; good for skin diseases (Ayurveda).

The seeds are used to purify the blood.

Assam: Ausa, Suila—; *Bengal:* San, Sanai, Sani, Shon, Sun—; *Bombay:* Santag—; *Burma:* Paikpiven, Paikshan—; *Canarese:* Henna, Pundi, Sanabu—; *Deccan:* Janab, San, Tag—; *English:* Bombay Hemp, Brown Hemp, False Hemp, Indian Hemp, Salsette Hemp, Sunn Hemp—; *Gujarat:* San, Suna—; *Hindi:* Ghagahi, Patashana, Shanahuli—; *Konkani:* Sanu, Son—; *Malayalam:* Chanaka, Djunam, Kattuttantalakatta, Pulivanni, Sanam, Vakku—; *Marathi:* Ghagharu, San, Tag—; *Mundari:* Jiri—; *North-Western Provinces:* Arjhasan, Phulsan, San—; *Persian:* San—; *Portuguese:* Linho—; *Sadani:* Sanai—; *Sanskrit:* Dhanahari, Dirghapallava, Dirghashakla, Karnagula, Katutikta, Malyapushpa, Nishadana, Sana, Satinaka, Shana, Tvakasara, Vamaka—; *Sind:* Sini, Tagsan—; *Sinhalese:* Hana, Hauna—; *Tamil:* Chanai, Kuttiram, Kuttu, Manji, Nanandam, Uttirabanni, Umadji, Vakkunnar—; *Telugu:* Janumu, Gilaka, Gilgichu, Giliginta—; *Travancore:* Wuchu—; *Uriya:* Choni, Sono—.

6. **Crotalaria medicaginea** Lam. Encycl. II (1786) 201.—PLATE 289B.

A perennial herb scarcely reaching 30 cm.; rootstock woody, branched; stems and branches numerous, diffuse, filiform, terete, sparsely clothed with appressed hairs. Leaves 3-foliolate; common petioles 2.5-5 mm. long; stipules minute, filiform. Leaflets 6-10 by 2.5-4 mm., oblanceolate, rounded, apiculate, glabrous, more or less silky beneath; petiolules distinct, very short. Flowers in terminal and leaf-opposed 2-6-flowered racemes; peduncles longer than the leaves, filiform; bracts minute, linear-subulate. Calyx 2.5 mm. long, silky outside with appressed hairs; teeth triangular, acute, exceeding the campanulate tube, all about equally long, the 2 upper a little broader. Corolla yellow, twice as long as the calyx; standard

silky on the back. Pods obliquely subglobose, 3 mm. long, sparingly silky, beaked. Seeds 2.

Distribution: Throughout India from the W. Himalaya to Ceylon and Burma.—Malay Archipelago, China, Australia, Afghanistan.

Gujerati: Ranmethi—; *Hindi:* Gulabi—; *Marathi:* Jenjaru—; *Porebunder:* Adabaumethi—; *Punjab:* Gulabi—.

The plant is officinal in the Punjab (Baden Powell).

7. **Crotalaria trifoliastrum** Willd. Sp. Pl. III, 983; Wight Ic. t. 421.—Plate 289A.

An erect perennial, 60-90 cm. high, herbaceous, with numerous, slender, elongated, ascending, finely downy, erecto-patent branches. Petioles 2.5 cm. or more, exceeding the obovate-oblong leaflets; stipules minute, setaceous; leaflets membranous, 1.3-2.5 cm. long, glabrous above, obscurely silky below, obtuse at the point, often deeply emarginate. Racemes copious, both terminal and lateral, short-peduncled, 12-40-flowered, elongated, reaching 10-15 cm. long; bracts minute, setaceous. Calyx 3 mm. long, finely silky; teeth linear, twice as long as the tube. Corolla yellow, glabrous, thrice the calyx. Pod subquadrangular, sessile, thinly silky, 4 mm. long.

Distribution: Assam, N. Circars, Carnatic, from Ganjam to Madras.

The root is used as a purgative.

8. **Crotalaria retusa** Linn. Sp. Pl. (1753) 715; Bot. Mag. t. 2561.

A robust undershrub 60-120 cm. high; branches striate, glabrous or appressedly pubescent. Leaves 3.8-9 by 1-2.2 cm., oblanceolate-oblong, obtuse or retuse, sometimes mucronate, rarely subacute, glabrous above, silky-pubescent beneath, base cuneate; petioles very short; stipules subulate. Flowers numerous, large and showy, in erect terminal racemes 15-30 cm. long; pedicels 6-8 mm. long; bracts subulate, 1 at the base of each pedicel and 2 much smaller about half way up. Calyx 10-13 mm. long, glabrous or nearly so outside; tube campanulate; upper teeth ovate, acute, divaricate, connate near the base only, the 3 lower teeth much narrower, triangular, acuminate,

connate about half the way up. Corolla much exserted, about 2.5 cm. long, yellow with a purple tinge; standard suborbicular, conspicuously veined, with a strong rib down the middle of the back. Pods 2.5-3.8 cm. long, stalked, linear-oblong, slightly broader upwards. Seeds 15-20.

Distribution: India generally, Ceylon, China.—Malaya, N. Australia, tropical Africa.

The plant is used in scabies and impetigo.

Bengal: Biljhunjhun—; *Bombay:* Ghagri—; *Ceylon:* Kilukiluppai—; *Gujerati:* Ghughra—; *Hindi:* Ghunghunian—; *La Reunion:* Cascavelle jaune, Pois rond marron—; *Malay:* Giring landak—; *Malayalam:* Kattukirukirakkayi, Kutiri, Tantalakkotti—; *Marathi:* Ghaghri—; *Porebunder:* Ghughra—; *Sanskrit:* Shanarghandika—; *Sinhalese:* Kaha-andana-hiriya—; *Telugu:* Pottigilligichcha—.

9. **Crotalaria sericea** Retz. Obs. fasc. 5 (1789) 26.

A short undershrub 90-120 cm. high; branches stout, striate, subglabrous. Leaves 5-15 cm. long, very variable in breadth, oblong-lanceolate, acute or subacute, mucronate, glabrous above, finely silky beneath, base cuneate; petioles 1.6-3 mm. long; stipules large, leafy persistent. Flowers in elongate terminal 20-50-flowered racemes 25-30 cm. long; pedicels longer than the calyx, with 1 large foliaceous ovate-acute bract at the base of each pedicel and a pair of minute subulate bracts on each pedicel below the middle. Calyx 13 mm. long, almost glabrous outside; tube campanulate, half as long as the teeth; upper teeth large, triangular, acute, about 6 mm. broad at the base, the 3 lower teeth smaller and less deeply cut than the upper, linear-lanceolate, acute. Corolla yellow with a purplish tinge; standard broadly ovate, with a strong midrib at the back. Pods glabrous, linear-oblong, stalked, 2.5-5 cm. long. Seeds 20-30.

Distribution: Throughout India generally, Andamans.—Malaya.

The plant is used in scabies and impetigo.

Bengal: Jhanjhania, Pipulijhunjhun—; *Hindi:* Jhunjhunia—; *Sanskrit:* Ghantarava—.

TRIGONELLA Linn.

Annual herbs. Leaves pinnately 3-foliolate, toothed; stipules adnate to the petiole. Flowers lemon-yellow, in axillary racemes. Calyx-tube campanulate; teeth distant, subequal. Petals free from the staminal tube; standard obovate or oblong; wings oblong; keel shorter than the wings, obtuse. Stamens diadelphous; filaments not dilated; anthers uniform. Ovary sessile or shortly stalked; ovules usually many; style glabrous; stigma terminal. Pod linear or linear-oblong, compressed or subterete (not spiral), usually exserted, continuous within. Seeds few or many.—Species 70.—Mediterranean, Europe, Asia, Australia, S. Africa.

A. Pod short, turgid .... 1. *T. occulta.*
B. Pod long, turgid
    1. Flowers 1-2 .... 2. *T. foenum-graecum.*
    2. Flowers 1-6, usually 2-4 .... 3. *T. polycerata.*
C. Pod linear or linear-oblong, flat .... 4. *T. corniculata.*

T. caerulea Ler. is used medicinally in Europe, *T. foenum-graecum* Linn. in Europe and China, *T. spicata* Sibth. and Sm. in Persia.

OFFICIAL:—The seeds of *T. foenum-graecum* Linn. in Austria, Germany, Portugal, Switzerland.

1. **Trigonella occulta** Del. Fl. Aegypt. Illustr. (1812) 71. —PLATE 290B.

A low densely caespitose diffuse annual; stems not more than a few inches long, pale, glabrous or with a few scattered silky hairs. Leaves pinnately 3-foliolate; petioles 6-10 mm. long, striate, silky-hairy when young; stipules 6 mm. long, leafy, deeply lancinate-toothed, strongly nerved. Leaflets 4.5-6 mm. long, oblanceolate-cuneate, sharply toothed, subglabrous above, sparsely silky beneath; nerves strong, conspicuous; lateral petiolules short, the terminal ones 1.5-2 mm. long. Flowers 2-4 together, in sessile axillary clusters. Calyx 3 mm. long, membranous, hairy; teeth longer than the tube, subulate. Corolla scarcely exserted; standard obovate-oblong; wings oblanceolate. Pods membranous, slightly longer than the calyx, oblong-ellipsoid, strongly veined, sparsely clothed with spreading

white hairs. Seeds 1-2, oblong, 1.5-2 mm. long, smooth, yellowish brown or sometimes mottled.

Distribution: Upper Gangetic Plain, Sind, Deccan.—Egypt and Nubia.

In Sind the seeds are used in dysenteric affections (Murray).

2. **Trigonella foenum-graecum** Linn. Sp. Pl. (1753) 777; Roxb. Fl. Ind. III (1832) 389.—PLATE 290A.

A nearly smooth erect annual. Stipules not toothed. Leaflets 2-2.5 cm. long, oblanceolate-oblong, toothed. Flowers 1-2, axillary, sessile. Calyx-teeth linear. Corolla much exserted. Pod 5-7.5 cm. long, with a long persistent beak, often falcate, 10-20-seeded, without transverse reticulations.

Distribution: Punjab and Kashmir, extending through Persia and Abyssinia to the Mediterranean.—Cultivated in many parts of India.

The seeds are hot, with a sharp bitter taste; tonic, antipyretic, anthelmintic; increase the appetite; astringent to the bowels; cure leprosy, "vata", vomiting, bronchitis, piles; remove bad taste from the mouth; useful in heart disease (Ayurveda).

The plant and seeds are hot and dry; suppurative, aperient, diuretic, emmenagogue; useful in dropsy, chronic cough, enlargements of the spleen and liver.—The leaves are useful in external and internal swellings and burns; prevent the hair falling off (Yunani).

Fenugreek seeds are considered carminative, tonic, and aphrodisiac. Several confections made with this article are recommended for use in dyspepsia with loss of appetite, in the diarrhœa of puerperal women, and in rheumatism.

An infusion of the seeds is given to small-pox patients as a cooling drink.

The seeds being toasted and afterwards infused are used by Native practitioners in Southern India for dysentery.

In the Konkan, the leaves are used both externally and internally, on account of their cooling properties.

The use of fenugreek as a medicinal agent is now obsolete in Europe and the United States. Formerly the seeds were employed in the preparation of emollient cataplasms, fomentations and enemata,

but were never given internally. The powdered seeds are still used in veterinary practice.

The seeds contain the alkaloid trigonelline.

Sreenivasaya, Sastry, and Srinivasarao have isolated a semi-drying oil which they have examined chemically (Ind. Sc. Congress; Allahabad, 1930. Nagpur, 1931).

The mucilage and the proteins of fenugreek have been isolated and studied chemically (20th Ind. Sc. Congress; Patna, 1933).

Afghanistan: Shamli—; *Algeria:* Holba—; *Arabic:* Hulbah—; *Bengal:* Haenugraeb, Methi, Methika, Methishah—; *Burma:* Penantazi—; *Canarese:* Mente, Mentepalle, Mentesoffu, Menthya—; *Catalan:* Cenigrechs, Fenugrechs—; *Ceylon:* Mathai, Uluvaarisi, Vendayam—; *Chinese:* Hu Lu Pa—; *Dutch:* Fenegriek—; *Egypt:* Helbek—; *English:* Fenugreek, Greek Hayes—; *French* Fenugrec, Foin grec, Graine Joyeuse, Sainegrain, Saine graine, Sènegrain, Sennegrain—; *German:* Bockshorn, Bockshornklee, Finegreitje, Finmargretjen, Griechisches Heu, Siebengezeit—; *Greek:* Boukeras, Tilis—; *Gujerati:* Bhaji, Methi, Methini—; *Hindi:* Methi, Muthi—; *Italian:* Fiengreco, Fieno greco—; *Languedoc:* Fénigré, Sénégré—; *Malayalam:* Ventayam, Venthiam, Uluva—; *Malta:* Fenugreek, Fienogreco, Helba, Fienu—; *Morocco:* Houlba—; *Mundari:* Asaraara—; *Persian:* Shamlid, Shamlit, Shamliz, Shanbalid—; *Punjab:* Methi, Methri, Methun—; *Russian:* Fenigrekova trava, Gretskaya sochevitsa, Pagitnik, Treugolka—; *Sanskrit:* Bahuparni, Bahupatrika, Dipani, Gandhabija, Gandhaphala, Chandrika, Jyoti, Kairavi, Kunchika, Mantha, Methi, Methika, Methini, Misrapushpa, Munindrika, Pitabija, Vallari, Vedhani—; *Sind:* Mathi, Mitha—; *Sinhalese:* Asumodhagam, Uluhal, Uluva—; *Spanish:* Alolva, Fenogreco—; *Tamil:* Vendayam, Ventayam—; *Telugu:* Mentikura, Mentulu—; *Urdu:* Methi—.

3. **Trigonella polycerata** Linn. Sp. Pl. (1753) 777.—*T. incisa* Royle Ill. I, 97.

A slender diffuse annual, clothed with appressed pubescence. Stipules semisagittate, with long points; leaflets obovate, sharply incise-dentate towards the apex; base deltoid, entire. Flowers 1-6,

sessile or on very short axillary peduncles. Calyx 4 mm.; teeth setaceous, shorter than the subcylindrical tube. Corolla slightly exserted. Pod 2.5-5 cm. long, falcate, transversely wrinkled, 10-20-seeded.

Distribution: Punjab Plain and W. Himalaya up to 6,000 ft.—Extending to W. Siberia and S. Europe.

The seeds are given in diarrhœic conditions.

Harboi Hills: Gawanishpat—; *Kharan:* Shimsh—; *Pab Hills:* Shirgona—.

4. **Trigonella corniculata** Linn. Syst. ed. X, 1180; Wight Ic. t. 384.—*T. fimbriata* Royle Ill. 197.

Glabrous; stems erect or nearly so, 30-60 cm., often robust. Leaflets 6-20 mm. Flowers 6-12, racemose; stalk produced beyond the flowers in an awn-like point. Calyx nearly glabrous; teeth about as long as the tube. Petals 2-3 times as long as the calyx. Pod glabrous, deflexed, about 20 by 2.5 mm., flat, slightly curved transversely veined.

Distribution: Bengal, Kumaon to Kashmir 5,000—12,000 ft.,—Afghanistan, Orient, S. Europe.

The bitter fruit is astringent and styptic. It is applied to swellings and bruises.

Belgaum: Tirapa—; *Persian:* Tirir—; *Sanskrit:* Malya—; *Urdu:* Pirang—.

MELILOTUS Tourn. ex Hall.

Annual or biennial herbs. Leaves pinnately 3-foliolate, the main nerves excurrent as marginal teeth; stipules adnate to the petiole. Flowers small, yellow or white, in slender axillary racemes; bracts and bracteoles minute or 0. Calyx-tube campanulate; teeth 5, subequal. Petals deciduous, free from the staminal tube; standard obovate or oblong, subsessile; wings oblong, longer than the obtuse keel. Stamens 10, vexillary filament free or connate in the middle with the others; filaments filiform; anthers uniform. Ovary sessile or stalked, with few ovules; style filiform incurved; stigma terminal.

Pod subglobose or oblong, indehiscent or tardily dehiscent; seeds 1 or few.—Species 20.—Temperate and subtropical regions of the Old World.

1. Corolla pale yellow. Standard exceeding wings and keel. Pod glabrous .... 1. *M. indica.*
2. Corolla white. Standard exceeding wings and keel. Pod glabrous .... 3. *M. alba.*
3. Corolla yellow. Standard the same length as the wings and keel. Pod hairy .... 2. *M. officinalis.*

The genus is considered suppurative and slightly astringent.

The following are used medicinally in Europe—*M. alba* Desr., *M. dentata* Pers., *M. officinalis* Willd., *M. parviflora* Desf.—; in the M'Zab—*M. italica* Lam.—; in Indo China—*M. suaveolens* Ledeb.—.

OFFICIAL:—The herb of *M. altissimus* Thuillier, *M. officinalis* (Linne) Desrousseaux in Germany; *M. dentatus* Pers., *M. hirsutus* Lipsky in Russia; *M. officinalis* Desr. in Austria and Russia.

1. **Melilotus indica** All. Pl. Pedem. I (1785) 308.—*M. parviflora* Desf. Fl. Atl. II (1800) 192.—PLATE 291B. (under *M. parviflora* Desf.).

An erect annual herb, 30-45 cm. high; stem and branches pale, slightly striate, glabrous or nearly so. Leaves 3-foliolate; petals 2-3.8 cm. long, very slender; stipules 6 mm. long, lanceolate, very acute, adnate to the petiole. Leaflets 12-16 by 8-10 mm., toothed, oblanceolate or obovate-cuneate (sometimes a few casually linear-oblong), rounded, truncate, or retuse at the apex, glabrous or with a few scattered hairs on both sides; petiolules of the lateral leaflets very short, those of the terminal leaflets 2.5-6 mm. long. Flowers small, in slender spicate close racemes; pedicels short, deflexed; bracts subulate. Calyx 1-1.5 mm. long; teeth triangular. Corolla twice the calyx. Pods ellipsoid, compressed, tapering at both ends, reticulato-venose, glabrous. Seed 1, oblong-ellipsoid, compressed, 2.5 mm. long, brown.

Distribution: Tropical zone of India, extending to S. Persia and S. Europe.—Introduced in many other countries.

The properties are the same as those of *Trigonella foenum-graecum;* increases "vata" (Ayurveda).

The seeds are said to be useful in bowel complaints and infantile diarrhœa, given as a gruel (Murray).

The plant has been used as a discutient and emollient; externally as a fomentation, poultice, or plaster for swellings.

Afrikaans: Steenklawer, Stinkklawer—; *Bengal:* Banmethi—; *English:* Small Melilot—; *Hindi:* Banmethi—; *Malta:* Melilot, Scented Trefoil, Trew, Xnien—; *Punjab:* Sinjee—; *Sanskrit:* Vanamethika—; *Sind:* Zir—; *South Africa:* Melilot—.

2. **Melilotus officinalis** Lam. Fl. Fr. II, 594; Encycl. IV, 63.—PLATE 291A.

A biennial herb. Stem erect. Leaves 3-foliolate. Stipules subulate-setaceous, entire. Leaflets obovate, of the upper leaves oblong. Racemes elongate, lax, much longer than the leaves. Flowers medium size, yellow, rarely whitish. Calyx $2\frac{1}{2}$ times shorter than the corolla, wings and keel subequilong, shorter than the standard. Pod pendulous, hairy, ovate, obtuse, mucronate, in the upper part of the suture obtusely keeled, reticulate with a few transverse anastomosing rugae. Seeds smooth.

Distribution: Nubra and Ladakh, 10,000—13,000 ft.—Oriental region, Europe.

The small fruit is demulcent, maturant, carminative, tonic, aphrodisiac; useful in leucoderma (Yunani).

The plant is said to possess styptic properties, and is employed in bruises.

The herb is aromatic, emollient, carminative. It relieves flatulence and is taken internally in Europe for this purpose. Externally it is applied as a fomentation or poultice for pains and aches. The decoction is emollient and occasionally employed in lotions and enemas.

The dried leaves and flowering tops yield coumarin.

Bengal: Baupiring—; *Bohemian:* Komonjk—; *Catalan:* Trebol oloros, Trifoli oloros—; *Danish:* Amur—; *Dutch:* Melote—; *English:* Common Melilot, Hart's Clover, Heartwort, King's Crown, Melilot, Plaister Clover, Whuttle Grass, Wild Laburnum, King's Clover, Melilot trefoil—; *French:* Couronne royale, Mélilot citrin, Mélilot officinal, Mirlirot, Trĕfle de cheval, Trĕfle des mouches, Trĕfle des sorciers,

Trĕfle jaune, Trĕfle odorant, Trĕfle sauvage, Trouillet—; *German:* Baerenklee, Egyptenkraut, Feldsteinklee, Ginstkraut, Guldenklee, Houigklee, Melotenkraut, Schotenklee, Siebenstundenkraut, Siebenzeit, Steinklee, Wolfsklee—; *Greek:* Lotos—; *Hindi:* Aspurk—; *Hungarian:* Sarkerep—; *Italian:* Erba vetturina, Meliloto—; *Persian:* Aklil ulmalak, Zirir—; *Polish:* Komonica swoyska, Lipka—; *Portuguese:* Meliloto—; *Russian:* Burkan, Donnik lekarstvennie—; *Spanish:* Meliloto officinal, Trebol oloroso—; *Swedish:* Amur, Molotengraes—; *Urdu:* Aspurk—.

3. **Melilotus alba** Desr. in Lam. Encycl. IV, 63.

A pubescent or nearly glabrous herb; stems erect, 0.3-0.9 m. Leaves of 3 leaflets; leaflets ovate or oblong, 1.3-2.5 cm., upper part toothed, base entire, lateral leaflets nearly sessile, terminal one stalked, veins parallel, running out into small sharp teeth; stipules narrowly lanceolate, long-pointed, united to the leaf-stalk. Flowers nearly 5 mm. long, white, in long, axillary racemes. Calyx bell-shaped; teeth 5, distinct, lanceolate, nearly equal, acute. Standard not clawed; wings and keel nearly equal, shorter than the standard; keel obtuse. Upper stamen free, others united. Style glabrous, incurved; stigma minute. Pod indehiscent, ovoid, about 3.6 mm. longer than the calyx, tipped with the persistent style; seeds 1 or 2.

Distribution: Plains of N. India, ascending up to 12,000 ft.—W. Asia, Europe.

In Central Europe the herb is occasionally used as a substitute for *M. officinalis.*

English: White Melilot—; *Mundari:* Pirimasuriara—; *Tasmania:* Bockhara Clover—.

Cyamopsis DC.

Erect herbs with appressed medifixed hairs. Leaves imparipinnate; stipules small, setaceous; leaflets usually 3 (rarely many), exstipellate. Flowers small, purplish, in axillary racemes. Calyx oblique; teeth unequal, the lowest the longest. Corolla caducous; standard obovate, sessile; wings oblong, free from the keel; keel erect, subincurved, obtuse. Stamens monadelphous; anthers uniform,

apiculate. Ovary sessile, many-ovulate; style incurved at the apex; stigma capitate. Pod linear, subtetragonous, acuminate, 2-valved, septate between the seeds. Seeds square, compressed.—Species 3.—Tropical Africa and Asia.

The genus is therapeutically inert.

1. **Cyamopsis tetragonoloba** Taub. in Engl. et Prantl Nat. Pflanzenfam. III, 3 (1894) 259.—*C. psoralioides* DC. Prodr. II (1825) 216.—PLATE 292 (under *C. psoralioides* DC.).

An erect annual, 30-60 cm. high, more or less clothed with appressed medifixed greyish hairs; stem grooved. Leaves 3-foliolate; petioles 2.5-3.8 cm. long, sparsely hairy; stipules 6-10 mm. long, linear-subulate, persistent. Leaflets 3.8-7.5 by 1.2-5 cm., elliptic, acute, sharply dentate (the teeth usually ending in a weak spine), clothed on both sides with appressed medifixed hairs, base acute; main nerves prominent; petiolules of the lateral leaflets 3 mm., those of the terminal one 6-12 mm. long. Flowers small, purplish, in axillary 6-30-flowered close racemes; peduncles and pedicels short, hairy; bracts linear-subulate, persistent, 4.5 mm. long. Calyx hairy outside, 5-6.5 mm. long to the extremity of the longest tooth; teeth very unequal, the 2 lowest the longest, linear-subulate, the 3 upper shorter, triangular-acute. Corolla slightly longer than the calyx; standard orbicular, shortly clawed. Pods thick, fleshy, subtetragonal, 3.8-5 cm. long, slightly pubescent. Seeds 5 or 6, square, slightly compressed.

Distribution: Cultivated in many parts of India.

The fruit is sweet and dry; indigestible, causes flatulence; laxative; causes "kapha"; improves appetite; removes biliousness and night-blindness (Ayurveda).

The stem and leaves appear to be officinal in the Punjab under the name of "guar" (Stewart).

Bombay: Gauri, Gawar, Godibavachi, Mutki—; *Burma:* Paipazoon—; *Gujarat:* Guwar—; *Hindi:* Gowar—; *Konkani:* Chitquimitqui—; *Las Bela:* Gowar, Gowaro—; *Marathi:* Bavachi, Gowar—; *North-Western Provinces:* Dararhi, Guar, Kachhur, Kauri, Khulti, Khurti, Kuwara, Phaligawar, Syansundari—; *Sanskrit:*

Bakuchi, Dridhabija, Gorakshaphalini, Gorani, Nishandyaghni, Sushaka, Vakrashimbi—; *Santal:* Bururaher—.

INDIGOFERA Linn.

Herbs, undershrubs or shrubs, with appressed laterally attached hairs, sometimes mixed with basifixed hairs, frequently silvery-canescent. Leaves simple, trifoliolate or imparipinnate, the side leaflets usually opposite, but sometimes alternate, entire; stipules usually small, shortly adnate to the petiole; stipels setaceous or 0. Flowers generally very small, usually reddish or purple, in axillary racemes or spikes, rarely solitary, rarely panicled, each flower pedicelled in the axil of a caducous bract; bracteoles 0. Calyx minute, campanulate, teeth subequal or the lowest longest. Corolla more or less caducous; standard ovate or orbicular, sessile or slightly clawed; wings oblong, slightly adherent to the keel; keel petals erect, obtuse, with a downward spur on each side near the base. Stamens diadelphous, the vexillary stamen free, the others with connate filaments; anthers uniform, apiculate. Ovary sessile or subsessile, 1-2- or many- ovulate; style glabrous; stigma capitate, sometimes pedi cellate. Pod usually linear-cylindric, rarely oblong or globose, straight or curved, sometimes angled, sometimes muricate, often torulose, septate within between the seeds. Seeds globose or cylindric and truncate; strophiole 0.—Species 350. Warm regions.

A. Leaves simple
    Pod 1-seeded, oblong, not spiny ....1. *I. linifolia.*
B. Leaves imparipinnate
  I. Flowers in axillary sessile or short-peduncled heads
    a. Leaves trifoliolate. Pod 1-2-seeded .... 2 . *I. glandulosa.*
    b. Leaves 5-11-foliolate. Pod 2-seeded .... 3. *I. enneaphylla.*
  II. Flowers solitary
    Shrubby. Stems erect, rigid .... 4. *I. aspalathoides.*
  III. Flowers in axillary racemes
    a. Leaflets alternate
    Leaves argenteo-canescent. Pod curved .... 6. *I. oblongifolia.*
    b. Leaflets opposite
      1. Leaflets 3. Racemes 6-12-flowered
        * Terminal leaflet sessile .... 5. *I. trifoliata.*
        ** Terminal leaflet stalked .... 9. *I. trita.*
      2. Leaflets 5. Pod not deflexed .... 11. *I. glabra.*

3. Leaflets 7, 9 or 11 (sometimes 13 in *tinctoria*)
 * Racemes 6-12-flowered
  Hairs of stem not gland-tipped
   Seeds 3-8. Pod straight, not torulose ...... 10. *I. articulata.*
 ** Racemes more than 12-flowered
  Pod cylindric, glabrous, not torulose .... 7. *I. tinctoria.*
4. Leaflets 13-21
  Standard and keel-petals glabrous .... 8. *I. pulchella.*

Anthelmintic and insecticide. Used in epilepsy, infantile convulsions, chorea, hysteria, and amenorrhoea.

The following are used medicinally in China, Indo China, and the Malay Peninsula—*I. tinctoria* Linn.—; in Persia—*I. linifolia* Retz.—; in Arabia and Egypt—*I. argentea* Linn.—; in Guinea—*I. tinctoria* Linn.—; in the Gold Coast—*I. dendroides* Jacq., *I. hirsuta* Linn., *I. simplicifolia* Lam.—; in Nigeria—*I. diphylla* Vent.—; in Tropical Africa—*I. hirsuta* Linn., *I. tinctoria* Linn.—; in Southern Africa—*I. arrecta* Hochst., *I. cylindrica* DC., *I. fastigiata* E. Mey., *I. spinescens* E. Mey., *I. tristis* E. Mey., *I. tristoides* N. E. Br., *I. zeyheri* Spr.; in Madagascar—*I. lyalli* Baker, *I. pedunculata* Hils. & Bojer, *I. tinctoria* Linn.—; in Tropical America— *I. anil* Linn.—; in Guiana —*I. anil* Linn., *I. gerardiana* R. Grah.—; in Brazil—*I. anil* Linn., *I. lespedezoides* H. B. K., *I. linifolia* Retz., *I. microcarpa* Desv.—.

1. **Indigofera linifolia** Retz. Obs. Bot. fasc. 4 (1786) 29 et fasc. 6 (1791) t. 2; Roxb. Corom. Pl. II t. 195; Wight Ic. t. 313. —PLATE 293.

Annual; stems numerous, much-branched, 15-45 cm. long, somewhat 2-edged, silvery-white with appressed hairs. Leaves numerous, simple, 12-25 by 1.5-2.5 mm., linear, acute at both ends, mucronate, silvery on both surfaces with appressed hairs; petioles 0-1.5 mm. long; stipules minute, setaceous. Flowers 6-12, in dense sessile or very shortly peduncled axillary racemes. Calyx 2.5 mm. long, very deeply cut, clothed with silvery hairs; teeth linear-subulate, many times longer than the tube. Corolla bright red, 2-3 times as long as the calyx. Pod 1.5-2 mm. long, globose, apiculate, glistening-white with appressed silky hairs. Seed 1.

Distribution: Throughout India, Ceylon, Baluchistan.—Afghanistan, Abyssinia, N. Australia.

It is given medicinally in febrile eruptions (Honnigberger).

The Santals use the plant in amenorrhoea along with *Euphorbia thymifolia.*

Bengal: Bhangra—; *Bombay:* Bhangra, Burburra, Pandharipale, Torki—; *Gujerati:* Jhinkigali, Nahanigali—; *Hindi:* Torki—; *Marathi:* Bhangra, Burbur, Torki—; *Mundari:* Beseratasad—; *Nasik:* Pandhi—; *Santal:* Tandikhodebaha—.

2. **Indigofera glandulosa** Willd. Sp. Pl. III (1800) 1227. —PLATE 294.

Annual, 23-50 cm. high, much-branched; branches long, slender, clothed with spreading hairs when young, not at all argenteo-canescent. Leaves 3-foliolate; petioles 1-1.3 mm. long, slender, hairy; stipules setaceous, minute. Leaflets 1.2-2.5 by 0.6-1.2 cm., oblanceolate, rounded or slightly retuse, apiculate, green and with a few appressed hairs above, glaucous, appressedly hairy and copiously nigro-punctate beneath; petiolules of the lateral leaflets 1.25-1.5 mm. long, those of the terminal leaflets longer. Flowers in short axillary sessile heads 6-10 mm. long. Calyx 2-2.5 mm. long, hairy outside; teeth long, setaceous. Corolla 2-3 times as long as the calyx. Pods 5 mm. long, pubescent, angled, the angles slightly winged and often toothed. Seeds 1-2, spherical, smooth and polished, sometimes mottled.

Distribution: W. Peninsula and Bundelkhand.

The seeds are employed as a nutritive tonic.

Bombay: Gavachamatmandi—; *Gujerati:* Vekhariyo—; *Marathi:* Bargadan—; Vekhariya—; *Sholapur:* Barbed—; *Telugu:* Baragadam, Barapatalu, Barapatam, Boomidapu—.

3. **Indigofera enneaphylla** Linn. Mant. II (1771) 571; Wight Ic. t. 403.—*I. semitrijuga* Forsk. Fl. Aegypt.—Arab. 137 (non Baker).—PLATE 295.

Annual or biennial; rootstock woody; stems densely cæspitose, 30-45 cm. long, trailing, prostrate but not rooting, much-branched, terete or somewhat angled, sparsely clothed with white appressed hair. Leaves 1.2-2 cm. long, 7-9- (rarely 11-) foliolate, nearly sessile; stipules scarious, 5-6.5 mm. long, ovate, long-cuspidate. Flowers small, in short-peduncled 10-20-flowered spicate heads about

1.2 cm. long; pedicels almost 0; bracts scarious, 2.5 mm. long, ovate, acuminate, persistent. Calyx 3-4 mm. long, hairy outside; teeth long, setaceous. Corolla bright red, slightly exserted. Pods 3-4 mm. long, cylindric, oblong, more or less clothed with white appressed hair. Seeds 2, globose.

Distribution: Plains of India, Ceylon, Angola, Malay Islands, Australia.

The juice of this plant is used as an antiscorbutic, alterative and diuretic; and is considered alterative in old venereal affections.

Canarese: Kenneggilu—; *Malayalam:* Cherupullate—; *Gujerati:* Bhonyagali—; *Marathi:* Bhuiguli—; *Sanskrit:* Vasuka—; *Tamil:* Cheppunerunji—; *Telugu:* Chalapachi, Cherragaddamu, Yerrapalleru—.

4. **Indigofera aspalathoides** Vahl ex DC. Prodr. 2 (1825) 231.—PLATE 296.

A low much-branched erect undershrub; branches rigid, terete, divaricately spreading, the young ones argenteo-canescent, the hairs soon falling off, the older ones purple and nearly glabrous. Leaves 1-5- (often 3-) foliolate, digitate, sessile, crowded on the young branches, but soon deciduous; stipules minute, subulate. Leaflets 2.5-6 mm. long, sessile, linear or oblanceolate, apiculate, rather fleshy, with a few white appressed hairs. Flowers solitary, axillary; pedicels filiform, longer than the leaves, but shorter than the pods. Calyx 1.5 mm. long; teeth linear-subulate. Corolla dark pink, exserted. Pods 1.2-1.5 cm. long, somewhat turgid, straight, glabrous or with a few scattered hairs. Seeds 6-8.

Distribution: Plains of Carnatic, Ceylon.

The leaves, flowers and tender shoots are said to be cooling and demulcent, and are employed in decoction, in leprosy and cancerous affections. The root is chewed as a remedy for tooth-ache and aphthæ. The whole plant, rubbed up with butter, is applied to reduce œdematous tumours. A preparation is made from the ashes of the burnt plant to remove dandruff from the hair. The leaves are applied to abscesses; and an oil is obtained from the root which is used to anoint the head in erysipelas.

This is one of the important ingredients of the specific oil for syphilitic and other skin diseases. A decoction of the entire plant is given as an alterative in secondary syphilis, psoriasis, etc.; on a trial of the decoction, I did not find it to possess any of the properties attributed to it (Koman).

Canarese: Nila, Sivamalli—; *Malayalam:* Manali—; *Sanskrit:* Ratakohomba, Sivanimba—; *Sinhalese:* Ratkohomba—; *Tamil:* Iraivanvembu, Shivanarbembu—.

5. **Indigofera trifoliata** Linn. Amoen. Acad. 4 (1759) 327; Wight Ic. t. 314.

Perennial, somewhat shrubby; stems much-branched, 30-60 cm. long; young branches with scattered white appressed hairs, soon glabrescent. Leaves membranous, subdigitately 3-foliolate; petioles 6-12 mm. long, slender; stipules small, setaceous. Leaflets 1-2.5 by 0.6-1 cm., oblanceolate, rounded and minutely apiculate at the apex, sparingly clothed with white appressed hairs above, more densely hairy, nigro-punctate and glaucous beneath; petiolules of the lateral leaflets 1.5 mm. long, the terminal leaflets sessile or nearly so. Flowers small, in congested sessile, 6-12-flowered racemes, which are usually shorter than the leaves; pedicels very short. Calyx 3 mm. long, hairy outside; teeth lanceolate-subulate. Corolla dark pink, nearly twice as long as the calyx; standard 4 by 2.5 mm., oblong-obovate, densely hairy on the back. Pods deflexed, 1.2-2 cm. long, straight, somewhat 4-gonous, thinly hairy, with 4 narrow wings one at each side of the suture, and with a few scattered white hairs, not torulose. Seeds 6-8.

Distribution: Throughout India, Ceylon.—Java, China, Philippines, N. Australia.

The seeds are prescribed along with other mucilaginous drugs as a restorative.

Bombay: Vekaria—; *Gujerati:* Ratimethi—; *Hindi:* Ganglimethi—; *Koya:* Miripindi—; *Marathi:* Lalmeti—; *Sholapur:* Barabeda—; *Telugu:* Baragadamu—.

6. **Indigofera oblongifolia** Forsk. Fl. Aegypt.—Arab. (1775) CXVIII, n. 455 and p. 137.—*I. paucifolia* Del. Fl. d'Egypte (1812) 251.—Plate 298 (under *I paucifolia* Del.).

A shrub 0.9-1.8 m. high; branches numerous, stout, woody, argenteo-canescent. Leaves imparipinnate; petioles 6-12 mm. long; stipules 3 mm. long, lanceolate, acuminate. Leaflets 3-5, alternate, 1.5-2.5 by 0.6-1.2 cm., oblanceolate or elliptic-oblong, more or less hairy above, hoary with dense fine white hairs beneath, base acute; petiolules of lateral leaflets 1.25 mm., those of the terminal 6 mm. long. Flowers small, in long spicate 20-50-flowered racemes reaching 10 cm. long, rather close, longer than the leaves; pedicels short. Calyx 2 mm. long, silvery outside; teeth as long as the tube, triangular, acute. Corolla red, thrice as long as the calyx; standard 1 cm. long, densely hairy on the back. Pods numerous, along the whole length of the rhachis, 1.2-2 cm. long, slightly curved outwards, torulose, hoary when young with a fine appressed pubescence. Seeds 6-8, oblong, obtusely 4-gonous, truncate at one end.

Distribution: Throughout the plains of India, Ceylon, Baluchistan, Arabia, tropical Africa, Java.

The root is cooling; improves appetite; removes "vata-rakta" and rheumatism.—The leaf is vulnerary; good in dysentery.—All parts are useful in enlargements of the spleen and liver (Ayurveda).

This indigo is credited with the same therapeutic properties as *I. tinctoria.*

It is considered an antidote to poisons of all kinds. The root boiled in milk is used as a purgative, and a decoction of the stem as a gargle in mercurial salivation.

Jhalawan: Jhal—; *Kharan:* Hudish—; *Las Bela:* Jhil—; *Nasirabad:* Jhil—; *Sanskrit:* Jhilla, Mridupatraka, Nila, Raktapala, Sujhilla—; *Saora:* Kondavempali—; *Sibi:* Jhil—; *Tamil:* Kuttukkarchammathi—.

7. **Indigofera tinctoria** Linn. Sp. Pl. (1753) 751.—Plate 299A.

A shrub 1.2-1.8 m. high; branches terete or more or less angular, slightly silvery from fine appressed hairs. Leaves 2.5-7.5 cm. long; petioles 1.2-2.5 cm. long; stipules small, subulate. Leaflets 9-13, opposite, membranous, green but drying a greyish black, 1.2-2.5 by 0.6-1.2 cm., oblong or oblanceolate, rounded, apiculate, glabrous

above or nearly so, thinly clothed with appressed hairs beneath, base acute; petiolules of lateral leaflets 1.25-2 mm., those of the terminal reaching 6 mm. long. Flowers numerous, in nearly sessile lax spicate racemes 5-10 cm. long. Calyx 1.25-1.5 mm. long, hairy outside; teeth triangular, acute, as long as the tube. Corolla pink, 4 mm. long; standard pubescent at the back. Pods 2-3.2 cm. long, linear, straight or slightly curved, apiculate, thickened at the sutures, glabrous, not torulose. Seeds 8-12.

Distribution: Widely cultivated in many parts of India.

The root and stem are hot with a sharp, bitter taste; laxative, expectorant, alexipharmac, anthelmintic; promote the growth of hair; used in abdominal complaints, heart diseases, insanity; cure "vata", tumours, fever, leucoderma, enlarged spleen, cephalalgia, injuries. The root is also useful in difficult micturition, snake-bite, caries of the teeth, consumption (Ayurveda).

The plant has a bitter bad taste; lessens inflammation; cures chronic bronchitis and asthma, especially of children; cures piles, leucoderma, bites of insects and reptiles, burns, scalds, ulcers, and skin diseases; good in lumbago, enlargement of the spleen and liver, flatulence; applied to the navel it acts as a diuretic and cathartic (Yunani).

The juice of the leaves has great repute as a cure for hydrophobia, being administered both internally and externally.

The root is used in hepatitis (Ainslie).

An extract of the plant is given in epilepsy and nervous disorders. It is also used in bronchitis and as an ointment in sores, old ulcers, hæmorrhoids.

Among the Mundas of Chota Nagpur the roots, pounded and macerated in water, are drunk in urinary complaints.

As in England, the blue bag is used in China as a domestic remedy for the stings of bees and wasps.

In Indo China the leaves are made into an ointment which is applied to contused, inflamed, or itchy parts. In Cambodia they are given as a decoction for blennorrhagia.

In Madagascar indigo is given as an emeto-cathartic for convulsions in children.

The root-bark is useless in the symptomatic treatment of snakebite (Mhaskar and Caius), and so also are the leaves in the treatment of scorpion-sting (Caius and Mhaskar).

Arabic: Neyleh, Nilaj—; *Bengal:* Nil—; *Betsimisaraka:* Engitra Tapitsakondry—; *Bhote:* Wasma—; *Bicol:* Tayang-tayungan—; *Bombay:* Guli, Nila—; *Brazil:* Erva anil, Guajana timbo—; *Burma:* Mainai, Shan-mai—; *Cambodia:* Trom—; *Canarese:* Ajara, Ajura, Hennunili, Ollenili, Nili—; *Chinese:* Hsiao Ch'ing, Mon Lan, Ta Ch'ing—; *English:* Common Indigo, Indigo—; *French:* Indigotier—; *Fulah:* N'gare tieoukoy—; *Gujarat:* Gali, Gari, Nil—; *Hausa:* Baba, Baba Kore, Baba rini—; *Hindi:* Gouli, Lil, Nil—; *Hova:* Aika—; *Indo China:* Cham, Hom nhom, Ma cuc, Tram—; *Konkani:* Nilli—; *Madagascar:* Engitra—; *Malay:* Nila, Tarum—; *Malaya:* Ta ching, Tai ching—; *Malayalam:* Amari, Dronica, Grymina, Madhuparnika, Nilam, Nili, Ranjani—; *Marathi:* Nali, Nili, Nuli—; *Mundari:* Japud tasad, Lilbari—; *Pampangan:* Tayung—; *Persian:* Nil, Nilah—; *Philippines:* Anil—; *Porebunder:* Gali, Gudi—; *Portuguese:* Indigo—; *Punjab:* Nil—; *Sanskrit:* Aklika, Asita, Bhadra, Bharavahi, Charatika, Dola, Dronika, Duli, Dulika, Gandhapushpa, Gandhapushpi, Gramina, Gramya, Kala, Keshi, Klitakika, Kutsala, Madhuparnika, Mahabala, Mahaphala, Meghavarna, Mochakrishna, Nila, Nilapushpika, Nili, Nilika, Nilini, Rangapatri, Rangapushpi, Ranjani, Ranjini, Shodhini, Shyama, Shyamalika, Sriphali, Sthiraranga, Tuni, Tuttha, Vijaya, Vrintika, Vyanjankeshi—; *Sinhalese:* Nilawari—; *Soussou:* Gare meri yegue—; *Spanish:* Anilera francesa—; *Tagalog:* Tayom—; *Tamil:* Asidai Attipurashadam, Avuri, Chamundi, Irasani, Karundoli, Madubarunigai, Nili, Nilakkali, Toli—; *Telugu:* Aviri, Nili, Syama—; *Tulu:* Nili—; *Turki:* Osma—; *Urdu:* Nila—; *Uriya:* Neli, Nili, Nilo—; *Visayan:* Tagum, Tagung—.

8. **Indigofera pulchella** Roxb. Hort. Beng. (1814) 57; Fl. Ind. III (1832) 382.—Plate 299B.

An erect ramous shrub 10-15 cm. high; branches striate, glabrous or more or less hairy. Leaves 7.5-15 cm. long; petioles 1.9-2.2 cm. long; stipules very minute, subulate, caducous. Leaflets 13-21, opposite or a few casually alternate, 1.2-2.5 by 0.8-1.5 cm., elliptic-oblong, rounded, truncate or emarginate, apiculate, thinly clothed with short grey appressed hairs, base acute; main nerves prominent on the under surface; petiolules of the lateral leaflets 2-3 mm., those of the terminal ones 6-9 mm. long. Flowers the largest of the genus, numerous, in moderately close short-peduncled racemes shorter than the leaves; pedicels short, slender, hairy; bracts large, boat-shaped, long-cuspidate, exceeding the buds silky-hairy, caducous. Calyx 2-3 mm. long, appressedly hairy outside; teeth short, triangular. Corolla purple, 1.2-2 cm. long; standard orbicular, as broad as long, glabrous on the back; keel-petals glabrous outside. Pods 2.5-4.5 cm. long, straight, turgid, cylindric, glabrous. Seeds 8-12.

Distribution: Throughout the hills of India.

A decoction of the root is given by the Santals for cough; and a powder of the same is applied externally for pains in the chest (Campbell).

Bhil: Togri—; *Burma:* Taw-maiyain, Taw-meyiang—; *Canarese:* Gogge—; *Dehra Dun:* Sakina—; *Garhwal:* Sakina—; *Hindi:* Hakna, Nil, Sakena—; *Kharwar:* Jirhul—; *Khond:* Vreda—; *Kolami:* Jhurhur, Uterr—; *Kumaon:* Sakena—; *Lepcha:* Hikpi—; *Malayalam:* Manali—; *Marathi:* Baroli—; *Reddi:* Siralli—; *Santal:* Dare huter, Lili bichi—; *Saora:* Siralli, Vuyye—; *Tamil:* Narinji—; *Uriya:* Girili—.

9. **Indigofera trita** Linn. f. Suppl. Pl. (1781) 335.—Plate 297.

An undershrub, 60-90 cm. high; branches hoary with fine appressed hairs. Leaves 3-foliolate; petioles 6-13 mm. long; stipules small, setaceous. Leaflets: the lateral ones opposite, nearly sessile, 13-22 by 6-13 mm.; the terminal stalked, 2-3.8 by 1-2.2 cm., all obovate-oblong, slightly emarginate, clothed with fine appressed grey hairs, base acute. Flowers small, in short sessile or stalked 6-12-flowered spicate racemes, which are shorter than the leaves. Calyx

3 mm. long, hairy outside; teeth linear-lanceolate. Corolla salmon-coloured, 6 mm. long; standard orbicular, hairy on the back. Pods divaricate or sometimes deflexed, rigid, straight, 4-gonous, spine-pointed, not torulose, silvery with fine appressed hairs. Seeds 6-10, oblong, truncate at both ends.

Distribution: Throughout India, Ceylon.—Tropical Africa, Malay Islands, N. Australia.

The seeds are used as a nutritive tonic.

Canarese: Torementi—; *Gujerati:* Vekhario—; *Porebunder:* Adbaugali—; *Sinhalese:* Walawari—; *Tamil:* Kandaram, Kattuyaviuri, Punalmurangai, Saubanjam—; *Telugu:* Nakkanaru—.

10. **Indigofera articulata** Goüan, Ill. et Obs. (1773) 49.—*I. argentea* Linn. Mant. 273.

A shrub 60-90 cm. high; stem and branches argenteo-canescent, more or less angled. Leaves 2.5-5 cm. long; petioles 6-13 mm. long; stipules minute, subulate. Leaflets 3-5, very rarely 7 (those of the lower leaves usually 3, those of the middle and upper leaves usually 5, the terminal leaflet the largest), 1.3-2.5 by 1-1.6 cm., obovate, rounded and apiculate at the apex, argenteo-canescent on both surfaces, base cuneate; petiolules of the lateral leaflets 0.8 mm., those of the terminal 3-6 mm. long. Flowers in short-peduncled or subsessile 12-20-flowered racemes shorter than the leaves; pedicels short slender. Calyx 1.25 mm. long, silvery-hairy; teeth triangular, acute, rather shorter than the tube. Corolla 4 mm. long; standard pubescent on the back. Pods 10 mm. long, thick turgid, recurved, shortly mucronate, silvery-canescent when young, finally glabrescent, torulose. Seeds 2-4 (commonly 3).

Distribution: Sind, Deccan.—Arabia, Egypt, Abyssinia.

The roots and leaves are bitter and tonic.

The seeds are considered anthelmintic.

Arabic: Houer—; *Canarese:* Karunili—; *English:* Wild Indigo—; *Hindi:* Surmainil—; *Las Bela:* Nir—; *Merwara:* Nil—; *Sanskrit:* Kalaklitaka—; *Tamil:* Aramuri, Iruppumuri,

Kattavuri—; *Telugu:* Karunili, Kondanili, Nili, Peddanili—; *Tigrinia:* Ellam-hobut—.

11. **Indigofera glabra** Linn. Sp. Pl. (1753) 751.—*I. pentaphylla* Murr. Syst. Veg. ed. 13 (1774) 564; Wight Ic. t. 385.

Annual, 30-90 cm. high; branches numerous, ascending, glabrous or with a few spreading deciduous eglandular hairs. Leaves 2-3.2 cm. long; stipules 4.5 mm. long, lanceolate, very acute, hairy, persistent. Leaflets 5, opposite, thin, 4.5-13 by 3-10 mm., obovate-elliptic, obtuse, apiculate, more or less appressedly hairy on both surfaces, the lateral leaflets shortly petioluled, the terminal with a petiolule 3-6 mm. long. Flowers small, in 2-4-flowered short axillary racemes; peduncles slender; pedicels short. Calyx 2.5 mm. long, hairy outside; teeth subulate. Corolla red, 3 mm. long. Pods 2-2.5 cm. long, straight, subcylindric or obscurely 4-gonous, glabrous, not torulose. Seeds 10-12, cubical.

Distribution: All over India, tropical Africa.

The leaves are bitter, tonic, and febrifuge; they are used externally as an emollient.

Psoralea Linn.

Herbs or undershrubs punctate with black or pellucid glands. Leaves simple or imparipinnate, stipulate. Inflorescence capitate, spicate, subracemose or fasciculate. Calyx-lobes subequal, or the lowest the larger, the two upper often connate. Petals all with distinct claws; keel obtuse, the tip slightly incurved. Upper stamen free or more or less connate with the others, the tube often closed at the commencement of flowering; anthers small, uniform or slightly dimorphous. Ovary sessile or shortly stalked; ovule 1; style filiform or dilated at the base, curved above; stigma terminal. Pod ovoid or oblong, 1-seeded, indehiscent, the pericarp usually adhering to the seed.—Species 100.—Tropical and subtropical regions.

Tonic, emetic, and anthelmintic.

The following are used medicinally in Indo China and China —*P. corylifolia* Linn.—; in Arabia—*P. bituminosa* Linn.—; in North

America—*P. physodes* Hook.—; in Mexico and the West Indies—*P. glandulosa* Linn., *P. pentaphylla* Linn.—; in South Africa—*P. pinnata* Linn., *P. polysticta* Benth.—.

1. **Psoralea corylifolia** Linn. Sp. Pl. (1753) 764.—PLATE 300A.

An erect annual 0.6-1.2 m. high; stem and branches grooved, studded with conspicuous glands and with a few appressed and spreading white hairs. Leaves simple, 3.8-7.5 by 2.5-5 cm., broadly elliptic, inciso-dentate, rounded and mucronate at the apex, sparingly clothed with white hairs on both surfaces, closely nigro-punctate, base cuneate, rarely rounded; main nerves 5, springing from the base, and 4-6 pairs of lateral nerves higher up from the midrib; petioles 6-25 mm. long, hairy and gland-dotted; stipules lanceolate, persistent. Flowers close, in dense axillary solitary 10-30-flowered racemes; peduncles 2.5-5 cm. long, hairy; pedicels very short. Calyx 3-4 mm. long, hairy outside; the upper teeth linear-lanceolate, the lower ovate, twice as long as the upper. Corolla bluish purple, nearly twice as long as the calyx; standard orbicular, 6 mm. long, clawed, glabrous. Pods 5 mm. long, ovoid-oblong, somewhat compressed, closely pitted, mucronate, black, glabrous. Seed 1, smooth, adhering to the pericarp.

Distribution: Throughout India, Ceylon.

The root is useful in caries of the teeth.—The leaves are good to stay diarrhœa.—The fruit is bitter; diuretic; causes biliousness; cures leprosy, skin diseases, "kapha", "vata", vomiting, asthma, difficulty in micturition, piles, bronchitis, inflammations, anæmias; improves the hair and the complexion.—The seeds are sweet, bitter, acrid; refrigerant, alterative, laxative, antipyretic, anthelmintic, alexeteric; betters taste; removes "kapha" and "rakta-pitta"; good for heart troubles, asthma, leucoderma, urinary discharges; heals ulcers, skin diseases, scabies. The oil is used in elephantiasis (Ayurveda).

The seeds are bitter and acrid; purgative, stomachic, anthelmintic, vulnerary, stimulant, aphrodisiac; improve appetite; good for

leucoderma, scabies, biliousness; cure blood diseases; applied externally and given internally in skin diseases (Yunani).

In Southern India, they are used as a stomachic and deobstruent, and prescribed in lepra and other cutaneous diseases.

In the Konkan, the seeds are used in making a perfumed oil which is applied to the skin.

Rai Bahadur K. L. Dey speaks highly of the oleo-resinous extract of the seeds, diluted with simple ointment, as an application to leucoderma. After application for some days the white patches appear to become red or vascular; sometimes a slightly painful sensation is felt. Occasionally some small vesicles or pimples appear; and if these be allowed to remain undisturbed they dry up, leaving a dark spot of pigmentary matter, which forms as it were a nucleus. From this point, as well as from the margin of the patch, pigmentary matters gradually develop which ultimately coalesce with each other, and thus the whole patch disappears. It is also remarkable that fresh patches are arrested by its application (*Ph. J.*, Sept. 24th, 1881).

The seeds are prescribed in combination with other drugs for the treatment of snake-bite and scorpion-sting (Charaka, Sushruta).

In Ceylon in cases of snake-bite the seeds are ground with water and the liquid poured into each nostril in stupor and coma. The powdered seeds are given internally (Roberts).

In China and Malaya the seeds are regarded as tonic and aphrodisiac, and they are used in certain cutaneous diseases.

In Indo China the fruit is prescribed in stomach ache, spermatorrhœa, and certain skin diseases.

In the North of Annam the seeds are macerated in alcohol and the liqueur is given in rheumatism and in women's diseases.

Several species of *Psoralea* have been used medicinally in America, and have been found to act as gently stimulating and tonic nervines. Tried in leprosy with a certain amount of success.

Powdered seeds were given internally to a case of leucoderma along with the application of oleate of Bawuchee to the affected parts. In the course of a few days the patches showed signs of redness from congestion, but gastrointestinal tract was so much irritated that the

patient refused to undergo further treatment. I have administered the tincture along with the external application of Bawuchee in a few cases of leucoderma without any benefit. A compound ointment of the powdered seeds of *P. corylifolia* and *Cassia tora* with lime juice was tried in cases of ringworm with marked beneficial results (Koman).

(1) The active principle of the seeds is an essential oil. A fixed oil and a resin occur in large quantities but these are not pharmacologically active substances. Traces of a substance of alkaloidal nature are also present.—(2) The essential oil has a powerful effect against the skin streptococci. It has a specific effect on the arterioles of the sub-capillary plexuses; these it dilates so that in this area plasma is increased. The skin becomes red, the melanoblasts are stimulated leading to pigment formation. This pigment is exuded and diffuses into the decolorised leucodermic patches.—(3) Local applications of the oleo-resinous extracts made from the seeds are beneficial in the treatment of cases of leucoderma of non-syphilitic origin(Chopra and Chatterji).

The seeds are useless in the antidotal treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

The seeds have been examined chemically by Manjunath (Ind. Sc. Congress; 1930, 1933). The composition of the fixed oil has been determined by Jois, Manjunath, and Venkata Rao (*Journ. Ind. Chem. Soc.*; X, 1).

Annam: Pha co—; *Bengal:* Bavachi, Hakuch, Latakasturi—; *Bombay:* Bawachi—; *Canarese:* Bavanchi—; *Ceylon:* Ravoti—; *Chinese:* Ku Tzu, Pu Ku Chih—; *Hindi:* Babachi, Babchi, Bavanchi, Bavanchiyan, Bavchiyan, Bhavanj, Bukchi—; *Gujarat:* Babchi, Bavacha, Bawachi—; *Indo China:* Bo cot chi, Cot chi, Dau mieu, Pha co chi—; *Malaya:* Khoo chee, Ku tzu—; *Marathi:* Babachi, Babchi, Bavachi, Bavachya—; *Persian:* Waghchi—; *Punjab:* Babchi—; *Sanskrit:* Aindavi, Asitatvacha, Avalguja, Bakuchi, Chandralekha, Chandraprabha, Chandraraji, Chandri, Kalameshi, Kalameshika, Kamboji, Kandughni, Kantaka, Kantida, Krimighni, Krishna, Krishnaphala, Kushtaghni, Kushthahantri, Kushthanashini, Putigandha, Putiphala, Putiphali, Shashilekha, Shulotkha, Sita,

Sitavari, Soma, Somaraji, Somavalli, Somavallika, Suparnika, Suprabha, Suvalli, Suvallika, Tvagadoshapaha, Valguja, Vanguji, Vejani—; *Sinhalese:* Bodi—; *Tamil:* Karpokarishi, Karpuvarishi—; *Telugu:* Bhavanji, Kalaginja, Kalugechcha, Karubogi, Korjashtam—; *Urdu:* Babechi—; *Uriya:* Bakuchi—.

COLUTEA (Tourn.) Linn.

Shrubs. Leaves imparipinnate. Stipules small. Flowers in few-flowered axillary racemes. Calyx campanulate, 5-toothed, the teeth subequal or the 2 upper shorter. Standard rounded, bi-plicate or bi-callose at the base, shortly clawed; keel-petals incurved, obtuse, with long connate claws. Stamens diadelphous. Ovary stipitate; ovules many; style longitudinally bearded above. Pod membranous, inflated, indehiscent or opening at the top.—Species 12.—S. Europe to Himalaya.

C. nepalensis Sims. is used medicinally in Europe.

1. **Colutea nepalensis** Sims. in Bot. Mag. t. 2622.—*C. arborescens* Linn. var. *nepalensis* Baker in Hook. f. Fl. Brit. Ind. II, 103.—PLATE 300B (under *C. arborescens*).

An erect deciduous shrub. Bark smooth, brown. Young shoots pale straw-coloured, the epidermis peeling off in long narrow strips. Leaves 5-15 cm. long, mostly clustered on very short dwarf shoots. Leaflets 9-13, opposite, 5-12 mm. long, obovate, usually retuse, entire, rather thick, clothed when young with minute adpressed hairs, glabrous above when mature. Petiolules minute. Flowers about 2 cm. long, yellow often tinged with red, in lax axillary few-flowered racemes about as long as the leaves. Pedicels 7.5-10 mm. long, canescent. Pod 3.8-5 cm. long, bladder-like, ovoid. Seeds many.

Distribution: Arid valleys of Inner Himalaya, 8,000—11,500 ft., Ladakh to Kumaon, Kuram Valley, W. Asia, S. Europe.

The leaves are purgative and the seeds emetic.

Afghanistan: Braa—; *Catalan:* Espantallops—; *Dutch:* Lombardsch linzeboom, Schaap-linseboom, Wild senneboom—; *English:* Bladder Nut-tree, Bladder Senna, Nepal Bladder Senna—; *French:* Baguenaudier, Baguenaudier en arbre, Baguenaudier à vessie,

Colutier, Faux séné, Séné indigĕne—; *German:* Blasenbaum, Falsche senna, Schaflinsebaum—; *Greek:* Kolitea, Koloutea—; *Italian:* Erba vescicaria, Kaggera, Vescicaria—; *Ladak:* Braa—; *Spanish:* Espantalobos.

MUNDULEA DC.

Shrubs usually sericeo-pubescent. Leaves imparipinnate; stipules small. Flowers in terminal racemes; pedicels fascicled along the rhachis; bracts small; bracteoles 0. Calyx campanulate; teeth short, the 2 upper often subconnate. Corolla rosy, exserted; standard large, clawed; wings falcate-oblong; keel incurved and obtuse at the apex. Stamens monadelphous; alternate filaments slightly dilated; anthers uniform. Ovary sessile; ovules many; style incurved, subterete, glabrous, inflexed at the very apex; stigma capitate. Pod subindehiscent, linear, flat, the sutures much thickened. Seeds reniform.—Species 12.—Tropical Africa, Madagascar, Ceylon, S. India.

Most of the species are employed to stupefy fish.

M. suberosa Benth. is used in the Gold Coast; *M. pauciflora* Baker, *M. striata* Dub. & Dop., *M. telfairii* Baker in Madagascar.

1. **Mundulea suberosa** Benth. Pl. Jungh. (1851-53) 248.—*Tephrosia suberosa* DC. Prodr. II, 249.—PLATE 301.

A small tree 3-4.5 m. high; bark pale, corky; branches sericeous. Leaves numerous; petioles 1.2-2 cm. long; stipules small. Leaflets 17-23, opposite or alternate, 1.2-4.5 by 0.6-1.5 cm., coriaceous, oblong-lanceolate, obtuse, glabrous and bright green above, silvery silky beneath; petiolules of the lateral leaflets 1.5 mm., those of the terminal 6 mm. long. Flowers in close terminal racemes, pedicels 1-1.5 cm. long, slender. Calyx 6 mm. long, clothed with silky hairs; teeth short deltoid. Corolla 1.9-2.2 cm. long, pinkish violet; standard silky outside. Pods 7.5-10 cm. by 8-10 mm., flattened, densely velvety with short golden-brown hairs, thickened at the sutures. Seeds 3-8, about 3 mm. long, yellowish brown.

Distribution: Konkan, Deccan, Circars, Carnatic, Ceylon.—Tropical Africa, Natal.

The seeds are used in Southern and Western India as a fish poison.

Ashanti: Gyamkawa—; *Canarese:* Bettahuruli, Kadubettahuruli, Kadutuvari, Menbundati—; *Deccan:* Supti, Surti—; *Malayalam:* Kattutuvara—; *Tamil:* Kadupporasu, Piralavaram, Vellaipporasu—; *Telugu:* Kondavempali, Palasaram, Palasarapatti, Vettibilludu—.

TEPHROSIA Pers.

Herbs or undershrubs. Leaves usually imparipinnate, sometimes simple, stipulate; leaflets opposite, usually numerous (rarely 1-3), parallel-veined, often silky beneath. Flowers in terminal or leaf-opposed racemes which are often leafy at the base, or solitary, or in pairs in the axils of the leaves. Calyx- teeth or -lobes subequal, or the 2 upper more deeply connate, or the lower longer. Petals clawed; standard suborbicular; wings obliquely obovate or oblong. Stamens diadelphous when the flower is fully open; anthers obtuse, uniform. Ovary sessile; ovules many (rarely 2); style incurved, often flattened, glabrous or bearded; stigma terminal often penicillate. Pod usually linear, flattened, many-seeded, 2-valved, continuous within or obscurely septate between the seeds. Seeds sometimes with a small strophiole.—Species 140.—Tropical and subtropical regions.

A. Pod slightly pilose or silky
  Style not bearded throughout
    1. Leaflets 11-21 .... 1. *T. purpurea.*
    2. Leaflets generally 5, sometimes 3 or 7, never 9.... 3. *T. petrosa.*
B. Pod densely hairy .... 2. *T. villosa.*

The leaves and roots are possessed of cathartic properties.

The following are used medicinally in Indo China—*T. purpurea* Pers.—; in the Philippine Islands—*T. luzonensis* Vogel—; in the West Indies, the Society Islands—*T. toxicaria* Pers.—; in Guiana —*T. cinerea* Pers., *T. frutescens* DC., *T. purpurea* Pers., *T. toxicaria* Pers.—; in Colombia—*T. senna* H. B. K.—; in North America—*T. virginiana* Pers.—; in Nigeria—*T. purpurea* Pers.—; in the Gold Coast—*T. vogelii* Hook. f.—; in South Africa—*T. capensis* Pers., *T. diffusa* (E. Mey.) Harv., *T. grandiflora* Pers., *T. kraussiana* Meissn., *T. lucida* Sond., *T. lupinifolia* DC., *T. macropoda* E. Mey., *T. semiglabra* Sond., *T. vogelii* Hook.—.

1. **Tephrosia purpurea** Pers. Syn. Pl. II (1807) 329.—*Galega purpurea* Linn.; Roxb. Fl. Ind. III (1832) 386.—Plate 302B.

A copiously branched herbaceous perennial 30-60 cm. high; branches spreading, glabrous or sparsely pilose. Leaves 5-10 cm. long; petioles 6-12 mm. long; stipules linear-subulate, nerved, erect or sometimes reflexed. Leaflets 11-21, oblanceolate, obtuse or retuse, mucronate, 2-2.8 by 0.8-1.2 cm., glabrous above, clothed with fine appressed silky hairs beneath, base cuneate; nerves close, ascending, slender, conspicuous on both surfaces; petiolules of lateral leaflets 1.5-2.5 mm., those of the terminal 3-4.5 mm. long. Flowers in leaf-opposed lax racemes 7.5-12.5 cm. long, the lower flowers of the racemes fascicled; pedicels slender; bracts subulate. Calyx 4 mm. long, thinly silky; teeth triangular-subulate, as long as the tube. Corolla twice as long as the calyx; standard pubescent on the back. Style flattened, glabrescent; stigma penicillate. Pods 3-4.5 cm. long, linear, slightly curved, mucronate, at first thinly hairy, finally glabrescent. Seeds 5-6.

Distribution: All over India, Malay Peninsula.

The root is an alexipharmac used in poisoning due to snake-bite; good for ulcers and wounds; useful in enlargement of the spleen. —The seeds are useful in poisoning due to rat-bite.—The whole plant is bitter and acrid; digestible, anthelmintic, alexeteric, anti-pyretic, alterative; cures diseases of the liver, spleen, heart, blood; cures tumours, ulcers, leprosy, asthma, bronchitis, "vata", piles, caries of the teeth.—The white-flowered variety is more effective than the red-flowered one (Ayurveda).

The root has a bitter bad taste; diuretic; allays thirst; enriches the blood; cures diarrhœa; useful in bronchitis, asthma, liver and spleen diseases, inflammation, boils, pimples.—The leaves are a tonic to the intestines; improve the appetite; useful in diseases of the lungs and of the chest; good in piles, syphilis, gonorrhœa (Yunani).

The root is bitter and given in tympanitis, dyspepsia, and chronic diarrhœa. Fresh root-bark, ground and made into a pill, with a little black pepper, is frequently given in cases of obstinate colic.

The plant is used internally as a purifier of the blood, and is considered a cordial. An infusion of the seeds is given as a cooling medicine.

The plant appears to act as a tonic and laxative. In Ceylon, it is employed as an anthelmintic for children.

In French Guiana the root is used to stupefy or poison fish.

This drug is said to be useful in cough and in derangement of the kidneys. A decoction of the drug 1 in 10 was administered in one ounce doses to cases of Bright's disease with dropsy, and found to possess diuretic properties in a mild degree (Koman).

Bengal: Bannilgachh, Sarphonka—; *Bombay:* Janglikulthi, Sarphunkha, Unhali—; *Canarese:* Empali, Kogge, Koggili, Phanike—; *Ceylon:* Kavilai, Kolinchi—; *Deccan:* Hunnali, Janglikulthi—; *French Guiana:* Bois nivré—; *Gujarat:* Ghodakan, Jhila, Sarpankho, Sharpankho—; *Hassan:* Mazmaz—; *Hindi:* Sarphoka, Sarphonka—; *Indo China:* Houi, Hui, Nha troi—; *Katagum:* Maraguwa—; *Katsina:* Kini—; *La Reunion:* Indigo bâtard, Indigo rouge—; *Madras:* Mollukkay—; *Malayalam:* Kolinnil—; *Marathi:* Sharapunkha, Sirapakha, Udhadi, Unhal—; *Mundari:* Bircakonda, Bircakonta, Lilcakonda—; *Panch Mahals:* Jhil—; *Porebunder:* Ghodakan, Sarpankho—; *Punjab:* Bansa, Bansu, Jhojhru, Sarpankh, Sarphonka—; *Sanskrit:* Banapunkha, Ishupunkhika, Kalashaka, Kalika, Kandapunkha, Kriti, Nilavriksha, Plihari, Plihashatru, Sayakapunkha, Sharapuchchha, Sharapunkha—; *Sind:* Surpunka—; *Sinhalese:* Pila—; *Sokoto:* Kini—; *Urdu:* Sarabhuka—; *Uriya:* Kolothiyapokha, Mohisiakolothiya, Pokha, Soropokha—.

2. **Tephrosia villosa** Pers. Syn. Pl. II (1807) 329.—Plate 302A.

Perennial; branches numerous, spreading, clothed with white appressed hairs. Leaves nearly sessile, 5-7.5 cm. long; stipules linear-lanceolate, acute, sometimes reaching 1 cm. long, deflexed or spreading (rarely ascending). Leaflets 11-19, grey-green, 1.2-2.2 cm. by 4.5-8 mm., narrowly oblanceolate, usually emarginate and mucronate, nearly glabrous above, silky beneath, base cuneate; petiolules of lateral leaflets 1.5 mm., those of the terminal 3 mm.

long. Flowers large, few, in lax elongate racemes 15 cm. or more in length, the lower flowers in distant fascicles, the lowest often in the axils of the leaves; pedicels very short; bracts linear-subulate, plumose. Calyx 11 mm. long, hairy outside; teeth thrice as long as the tube, linear-subulate, densely hairy. Corolla red; standard equalling the calyx, suborbicular, silky on the back. Style flattened, glabrous; stigma penicillate. Pods 2.5-3.8 cm. long by 4-5 mm. broad, persistently velvety with dense spreading fulvous hairs, very shortly mucronate, falcately curved upwards. Seeds 6-8.

Distribution: Throughout the plains of India, Ceylon, Mauritius, tropical Africa.

In Pudukota the juice of the leaves is given in dropsy.

Porebunder: Runchhalisarpankho—; *Sinhalese:* Bupilla—; *Tamil:* Punaikkaivetlai—; *Telugu:* Nuguvempali—; *Uriya:* Sroetokolothiya—.

3. **Tephrosia petrosa** Blatter & Hallberg in Journ. Bom. Nat. Hist. Soc. XXVI (1918) 239.—*T. spinosa* Baker in Fl. Brit. Ind. II, 112 (partim, non Pers.).

An undershrub or a low shrub, profusely branching from the base and higher up, the terminal branches very slender, silvery canescent, angular. Leaves 4.5 cm. long, stipules 5-6 mm. long, subulate, with a conspicuous median rib, silvery canescent, generally bent back; rhachis hirsute; petiolules scarcely reaching 1 mm., hirsute; leaflets generally 5, sometimes 3 or 7, never 9; the terminal one generally the largest, 2.7 cm. long, 9 mm. broad, all obovate, rounded at the apex, mucronate, on the upper surface quite glabrous, the lower surface, the margin and the mucro densely silvery canescent. Axillary flowers solitary, rarely 2; pedicels about 2.5 mm. long in flower, in fruit 5 mm.; calyx 3 mm. long, not widened in fruit, lobes subulate, as long as the tube; pedicel and calyx very hirsute; corolla large, very much exserted, conspicuous, red-purplish; vexillum hairy on the back; stamens diadelphous. Ovary densely hirsute; style glabrous; stigma large, penicillate. Legume 3-5 cm. long, linear, attenuate towards the base, very much curved, cuspidate, silvery canescent. Seeds up to 8, twice as broad as long, subcylindric, slightly compressed, olive-coloured, variegated.

Distribution: W. Rajputana; Jodhpur, Jaisalmer.

The plant is hot with a sharp taste; anthelmintic, analgesic; same porperties as *T. purpurea* but in a milder degree. (Ayurveda).

The leaves boiled in water and eaten are considered to be good against syphilis (Blatter and Hallberg).

Rajputana: Bishoni—; *Sanskrit:* Kanthalu, Kanthapunkha, Kanthapunkhika—.

GLYCYRRHIZA Linn.

Perennial, generally glandular herbs, with a sweet root. Leaves odd-pinnate. Axillary racemes or heads and bluish or violet flowers. Calyx somewhat 2-lipped, upper teeth connate higher than the lower ones. Standard narrow, wings and keel acute. Stamens diadelphous, anthers somewhat 2-valved on account of cells joined at the apex. Ovary many-ovuled, style glabrous, incurved at the apex; stigma terminal, capitate. Pod leathery, oblong to linear, flattened, or necklace-like, rarely ovate, turgid, not divided within, indehiscent or somewhat dehiscent.—Species 12.—Temperate and subtropical.

G. echinata Linn., *G. glabra* Linn., *G. uralensis* Fisch. are used medicinally in Europe and China, *G. glabra* Linn. in Indo China.

OFFICIAL:—The roots of *Glycyrrhiza spp.* (Great Britain); *G. glabra* Linn. (Austria, France, Germany, Great Britain, Holland, Italy, Spain, Turkey, United States); *G. glabra* var. *glandulifera* Waldst. and Kit. (Holland); *G. glabra* Linn. var. *glandulifera* Regel and Herder (Austria, Denmark, Hungary, Japan, Norway, Russia, Sweden, Switzerland, United States); *G. glabra* var. *typica* Regel and Herder (Belgium, United States); *G. glabra* Linn.=*Liquiritia officinalis* Moench. (Portugal); *G. uralensis* Fisch. (Russia).

1. **Glycyrrhiza glabra** Linn. Sp. Pl. (1753) 1048, var. *glandulifera* Reg. et Herd. Pl. Semen 37; Blatter, Hallberg & McCann in Contrib. Fl. Baluchistan 20.

A tall perennial plant 50 cm. to 1 m. high or more, erect. Leaflets 4-7 pairs, oblong to elliptical-lanceolate, acute or obtuse; racemes loose, shorter than the leaves or a little longer. Flowers 1 cm. long. Pods oblong to linear, 1-3 cm. long, flattened, straightish,

more or less densely echinate glandular, many-seeded or abbreviated and 2-3-seeded.

Distribution: British Baluchistan.—Europe, Mediterranean, N. Africa, Orient, Soongaria.

The root is sweet, slightly bitter; refrigerant, tonic, aphrodisiac, alexeteric, diuretic, alterative, galactagogue; good for the eyes, in incipient loss of sight, in diseases of the eyelid; removes biliousness, ear diseases due to biliousness; improves taste; lessens thirst, hiccough, vomiting, fatigue; heals ulcers, wounds; improves the voice; cures "vata", inflammation, consumption, purifies the blood; useful in leprosy, anæmia; hemicrania, hæmoptysis, abdominal pains, epilepsy (Ayurveda).

The root is hot, dry, sweet; diuretic, emmenagogue, maturant, demulcent; relieves thirst, cough, vomiting, asthma, bronchitis, abdominal colic, headache; good in eye troubles; cures unhealthy humours, ulcers.—The branches are bitter.—The leaves are used for scalds of the head, and in foul perspiration of the armpits (Yunani).

The root is demulcent, pectoral, and emollient. It is one of the most popular and well-known remedies in Europe for coughs, consumption, and chest complaints.

In Zhob the root is used for coughs.

The root is said to be good for sore throats. When chewed it has a not unpleasant rather sweet flavour, somewhat like that of an uncooked green pea. It is also mixed with other drugs for derangements of the blood (Hotson).

The root is a drug of great importance in Chinese pharmacy. It has tonic, alexipharmac, alterative, and expectorant properties.

The root in combination with other drugs is prescribed for the treatment of snake-bite (Charaka, Sushruta, Vagbhata, Sharangdarsamhita, Vaidyavinoda, Vrindamadhava, Rasaratnakara) and scorpion-sting (Charaka, Sushruta, Chakradatta).

The root is not an antidote to snake-venom (Mhaskar and Caius) or scorpion venom (Caius and Mhaskar).

Afghanistan: Makk, Sus, Zaisi—; *Arabic:* Aslussus, Irkessus—; *Behar:* Muraiti—; *Bengal:* Jaishbomodhu, Jashtimadhu—; *Bombay:* Jashtimadhu—; *Burma:* Noekhiyu, Noek-

hiyuanu—; *Calabria:* Gurigulizia, Legno dolce, Regalissa, Regalizia, Regolizia, Rigulizia—; *Canarese:* Atimadhura, Yashtimaduka—; *Cantonese:* Kom Ts'o—; *Catalan:* Regalessia, Regalissia—; *Chaman:* Khwazha, Malkhuzi—; *Chinese:* Kan Ts'ao—; *Danish:* Lakris—; *Deccan:* Mithilakri—; *Dutch:* Zoethout—; *English:* Liquorice—; *French:* Bois doux, Racine douce, Réglisse—; *Genoa:* Liccarissa, Recanicu, Rigolicia—; *German:* Lackrizen, Suessholz—; *Gujarat:* Jethimadha—; *Hindi:* Jethimadh, Mulhatti—; *Hindubagh:* Malkhuzi, Malkhuzzi—; *Indo China:* Cam thao—; *Italian:* Liquirizia, Legorizia, Regolizia, Ugorizia—; *Kalmuk:* Schiker boja—; *Kila Saifulla:* Malkhuzi, Malkhuzzi—; *Mach:* Wazhdar—; *Languedoc:* Recalissi, Recalisso—; *Malaya:* Kam chow—; *Malayalam:* Atimadhuram, Irattimadhuram, Yashtimadhukam—; *Marathi:* Jeshtamadha—; *Naples:* Liqurizia—; *North-Western Provinces:* Muleti—; *Norwegian:* Lakris—; *Padua:* Liquerizia—; *Pavia:* Regoulizia, Rigoulizia—; *Persian:* Bikhemahak, Mazhn, Mahak—; *Pishin:* Khwazha, Malkhuzi—; *Polish:* Lakrycya—; *Portuguese:* Alacuz, Regoliz—; *Puglia:* Liquirizia siliquosa—; *Punjab:* Alasus, Jetimadh, Muleti—; *Quetta:* Khwazha, Malkhuzi—; *Reggio:* Liquerezia, Ziglott—; *Roumanian:* Lemn dulce—; *Russian:* Dubez solotkoi, Solodka gladkaya—; *Sanskrit:* Jalayashti, Klitaka, Madhuka, Madhusrava, Madhuyashti, Madhuyashtika, Sthalayashti, Yashtika, Yashtimadhu, Yashtirasakrya, Yashtyawa—; *Sardinia:* Aregolizia—; *Shahrig:* Malkhuzgi—; *Sicily:* Gurigulizia, Legmo dolce, Niculizia, Regalissa, Regalizia, Regolizia, Rigulizia—; *Sinhalese:* Atimaduram, Velmi—; *Spanish:* Orozuz, Palo dulce, Regaliz, Regaliza—; *Swedish:* Lakritz—; *Tamil:* Adimaduram, Atimaduram—; *Telugu:* Atimaduramu, Yashtimadhukam—; *Treviso:* Liquerizia—; *Turkish:* Meyan—; *Tuscany:* Dolce radice, Logorizia, Lugurizia—.

MILLETTIA Wight & Arn.

Trees, shrubs or large woody climbers, with odd-pinnate, rarely 1-foliolate leaves; leaflets opposite, usually large, reticulate-veined,

generally stipellate. Flowers showy, in axillary solitary or fascicled racemes, and in terminal panicles, the flowers single or in fascicles along the rhachis. Calyx campanulate, teeth usually short. Corolla much exserted, petals long-clawed; standard broad, spreading or reflexed; wings oblong, falcate; keel incurved, obtuse. Stamens 1-adelphous or 2-adelphous, filaments filiform; anthers uniform, muticous. Ovary linear, sessile or nearly so, surrounded at the base by an annular disk-like sheath; ovules many; style filimorm, incurved, glabrous, stigma capitate. Pod linear, lanceolate or oblong, usually compressed, thickly coriaceous or woody, late or hardly dehiscent.—Species 120.—Tropics and subtropics of the Old World.

1. Standard auricled at the base on both sides of the claw. Stamens monadelphous .... 1. *M. auriculata.*
2. Standard not auricled at the base. Stamens monadelphous ... 2. *M. pachycarpa.*

M. ichthyochtona Bureau and Franch. is used medicinally in Indo China.

1. **Millettia auriculata** Baker in Hook. f. Fl. Brit. Ind. II, 108.

A large robust woody climber with finely downy branchlets. Leaves 30-60 cm. long; petiole 10-15 cm., swollen at the base; leaflets 7-9, opposite, 7.5-20 cm. long, obovate, obtuse or cuspidate, membranous or subcoriaceous, densely grey-silky when young, at length glabrescent above; stipels minute. Flowers in dense axillary racemes near the ends of the branches, fascicled on a downy rhachis; bracts minute, linear. Calyx 3 mm., densely silky, teeth very short. Corolla whitish, 3 times the calyx, densely silky. Pod 12.5-18 cm. long and about 2.5 cm. broad, straight, woody, permanently clothed with reddish brown tomentum; sutures thickened.

Distribution: Outer Himalaya from the Sutlej eastwards to Sikkim, up to 3,500 ft., Bengal and South to the Godavari.

In Chota Nagpur the roots are applied to sores on cattle to kill vermin; they are also used to poison fish (Campbell).

Burma: Wunu—; *Gond:* Gurur—; *Haldwani:* Goj—; *Hindi:* Gauj—; *Kharwar:* Gurar—; *Kolami:* Hel—; *Koya:* Nedibunda—; *Kumaon:* Ganj, Gauj, Gauja, Gonjha—; *Kurku:* Murari—; *Lepcha:* Brurik, Tarorrik—; *Malayalam:* Vallimuritali—;

Mundari: Haranari, Helaranari, Helharanari—; *Nepal:* Gonjo—; *Oudh:* Mandh—; *Santal:* Hehel—; *Saora:* Sindugaboddu—; *Telugu:* Kondatangedutige—; *Uriya:* Kissi—.

2. **Millettia pachycarpa** Benth. Pl. Jung. 250.

A large climber with the branches and leaves below more or less densely clothed with pale brown pubescence. Leaves 30 cm. or more long; leaflets 11-13, subcoriaceous, oblanceolate-oblong, cuspidate, exstipellate, 15-20 cm. long, glabrous, opaque above, sometimes subcordate, the pubescence below short, loose, deciduous; petiolules 4-6 mm. Racemes copious, 15-23 cm. long, most of the nodes with short branchlets. Calyx 4-6 mm., distinctly pedicelled, densely downy, teeth very short, corolla 2-2.5 cm. long, standard glabrous on the back, stamens monadelphous. Pod woody, rugose, glabrous, 1-3-seeded, 2.5-3.2 cm. broad, 10-12.5 cm. long.

Distribution: Sikkim, Assam, Khasia, up to 4,000 ft.

The root is used to poison fish.

Bengal: Bishloti—; *Nepal:* Kakushbish, Kurkus—.

ADINOBOTRYS Dunn.

Woody climbers or trees. Leaves alternate imparipinnate; leaflets opposite, 5-toothed. Standard round, short-clawed; wings oblong semi-sagittate. Stamens free from standard, diadelphous. Ovary stipitate. Pod egg-shaped dehiscent. Seed 1, large (rarely 2) not flattened.—Species 5.—Indo-Malaya, China.

The genus is therapeutically inert.

1. **Adinobotrys atropurpureus** Dunn. Kew Bull. (1911) 197.—*Millettia atropurpurea* Benth. Pl. Jung. 249.—*Pongamia atropurpurea* Wall. Cat. 5910; Pl. As. Rar. t. 78.

A very large tree 18-24 m. tall with a large head. Leaves 38-45 cm. long, glabrous; leaflets 3-4 pairs, coriaceous deep shining green, narrow-oblong, base round, tip short cuspidate, 10-15 cm. long, 3.8-5 cm. across; petiolules 6 mm. long. Racemes copious in a dense tomentose panicle 15-20 cm. long. Bracts ovate, 2.5 mm. across; pedicels 5 mm. long. Calyx 6 mm. long, campanulate, teeth small, 2 upper truncate, others acute, silky. Corolla black purple,

13 mm. long. Pod about 10 cm. long, 5 cm. wide, 1-2-seeded, dark brown. Seeds 1 or 2, large thick brown.

Distribution: Malay Peninsula, Tenasserim.—Borneo, Sumatra.

The root is used as a fish poison.

Burma: Danyinnie—; *Malay:* Chicha, Girah payah, Merbong, Tulang daeng—.

SESBANIA Scop.

Herbs or soft-wooded trees or shrubs. Leaves abruptly pinnate; leaflets numerous, linear-oblong, obtuse, quite entire, mucronate, deciduous. Flowers in axillary lax racemes. Calyx campanulate, shallowly 2-lipped or 5-toothed. Corolla much exserted; petals all with long claws; standard orbicular or ovate, spreading or reflexed; wings falcate-oblong; keel obtuse and straight, or subrostrate and recurved. Stamens diadelphous; anthers uniform. Ovary usually stalked, many-ovulate; style incurved, glabrous; stigma small, capitate. Pod very long and narrow, dehiscent, septate transversely between the seeds. Seeds numerous, oblong or subquadrate. —Species 24.—Tropical and subtropical regions.

A. Pods 15-23 cm. long
  1. Unarmed. Pod twisted, torulose .... 1. *S. aegyptiaca.*
  2. Armed. Pod not twisted, not torulose .... 2. *S. aculeata.*
B. Pods often 30 cm. long .... 3. *S. grandiflora.*

The bark is a bitter tonic and febrifuge; the flowers and leaves are aperient.

The following are used medicinally in Indo China and the West Indies—*S. grandiflora* Pers.—; in the Philippine Islands—*S. aegyptiaca* Pers., *S. grandiflora* Pers.—.

1. **Sesbania aegyptiaca** Poir. Encycl. VII (1806) 128, var. *picta* Prain in Journ. As. Soc. Beng. 66 (1898) 367.—PLATE 303.

A small soft-wooded tree of rapid growth and brief duration reaching 4.5 m. height and 15 cm. diam., young shoots striate, green, canescent. Leaves 7.5-15 cm. long, paripinnate; rhachis shortly produced above the last pair of leaflets, not spinescent; stipules 3.8 mm. long, linear, acute, caducous. Leaflets 9-14 pairs, opposite,

1.8-2.5 cm. by 3.8-6 mm., linear-oblong, entire, obtuse, often faintly apiculate, puberulous when young, minutely petiolulate. Flowers 1.2-1.5 cm. long, yellow, in lax, slender, few-flowered, axillary racemes; buds straight; pedicels filiform, 5-10 cm. long; bracts less than 2.5 mm. long, lanceolate, scarious, bracteoles setaceous, both fugacious. Calyx 5 mm. long, campanulate, 5-nerved; teeth deltoid, subequal, shorter than the tube. Standard orbicular, spotted with purple on the back, furnished at the base with 2 keel-like appendages which are free and falcate above, running down wing-like into the claw; wings falcate-oblong, with a minute auricle at the top of the claw; keel straight, obtuse, its petals with a small recurved auricle above the claw. Stamens diadelphous; anthers uniform. Ovary stipitate; style incurved, glabrous; stigma capitate. Pod 15-23 cm. long by 2.5-3.8 mm., pendulous, twisted, flexible, slightly torulose, sharply beaked, sutures not much thickened, septate between the seeds. Seeds 20-30.

Here belongs, also the form with uniformly yellow flowers (var. *typica* Prain) and another with the standard dark maroon or purple outside and the keel tipped with red (var. *bicolor* Prain).

Distribution: Throughout the tropics of the Old World; var. typica probably introduced from America.

The root is hot and bitter; carminative, alterative, anthelmintic; removes "kapha", biliousness, inflammation; cures tuberculous glands, fevers, ulcers, diabetes, leucoderma; relieves throat troubles; an excellent cure for scorpion-sting.—The bark is astringent.—The seeds remove smallpox eruptions (Ayurveda).

The leaves are purgative, anthelmintic, maturant, demulcent; useful for hydrocele and all pains and inflammations.—The seeds are emmenagogue, stimulant, astringent; heal chronic ulcers and eruptions; useful in diseases of the spleen, diarrhœa, and excessive menstrual flow (Yunani).

In the Punjab the seeds, mixed with flour, are applied externally for itching of the skin.

In Dacca the juice of the fresh leaves is given as an anthelmintic.

The root is not an antidote to scorpion-venom (Caius and Mhaskar).

Arabic: Saisaban, Sasaban—; *Bengali:* Jayanti—; *Berar:* Saori, Sewri, Shewari—; *Bombay:* Jait, Janjan, Sewri, Shevari, Shewari—; *Burma:* Yethugyi—; *Canarese:* Arasinajinangi, Jayanti, Jinangi, Karijinangi—; *Central Provinces:* Saora—; *Deccan:* Sheveri, Shewari—; *Gujarati:* Raysingani—; *Hausa:* Alambo, Sasabani—; *Hindi:* Dhandiain, Jait, Janjhan, Jayanti, Jet, Jhijam, Jhijan, Rasin—; *Malayalam:* Kitannu, Mellitali, Shempa—; *Marathi:* Jayat, Sevari, Shewari—; *Mundari:* Lildaru, Miruba—; *North-Western Provinces:* Jaint—; *Persian:* Sisiban—; *Porebunder:* Jayati—; *Sanskrit:* Jaya, Jayanti, Jayaya, Nadeyi, Raja, Vaijayanti—; *Tagalog:* Malacaquios—; *Tamil:* Asnapanni, Karunjembi, Sagudai, Sembai, Sittagatti—; *Telugu:* Jalugu, Lingashimma, Mallasominta, Sominta—; *Urdu:* Jait—; *Uriya:* Joyontri—.

2. **Sesbania aculeata** Pers. Syn. II (1807) 316.—PLATE 304.

A sparingly-branched annual of rapid growth, sometimes reaching 2.5 m. or more in height; stems semiwoody; branches and leaf-rhachises more or less prickly. Leaves abruptly pinnate, sometimes reaching 30 cm. in length; stipules membranous, acuminate, caducous. Leaflets 20-50 pairs, close, 10-20 by 3 mm., linear-oblong, obtuse, strongly mucronate, glabrous, base acute; petiolules very short. Flowers in lax axillary 3-6-flowered drooping racemes; peduncles slender; pedicels 6 mm. long, filiform. Calyx 3-4 mm. long, membranous, glabrous; teeth deltoid, much shorter than the tube. Corolla 10-13 mm. long, yellow, usually with red dots on the back of the glabrous standard. Pods 15-23 cm. long, not twisted, slightly falcate, beaked, not torulose.

Distribution: Cosmopolitan in the tropics of the Old World.

The root is alexeteric, anthelmintic, diuretic, galactagogue; useful in diseases of the eye.—The seeds are good for ringworm, and skin diseases (Ayurveda).

In the Punjab the seeds are used for the same purpose and in the same way as those of *S. aegyptiaca*.

In Las Bela the plant is considered a cure for wounds, and the

root if powdered and administered to a person bitten by a snake will cause vomiting and may cure (Hughes-Buller).

Bengal: Dhanicha, Dhunchi, Dhunsha, Jayanti—; *Bombay:* Ranshewra—; *Burma:* Najan ben, Nyaeh, Pouk—; *Canarese:* Mullujinangi—; *Gujarat:* Ikad—; *Hausa:* Alambo—; *Hindi:* Brihatchakramed, Dhunchi, Jayanti, Vanjayanti—; *Kathiawar:* Ikad—; *Kotra:* Majandri—; *Las Bela:* Akar—; *Malayalam:* Kitamu—; *Marathi:* Bhuiavali, Chinchani, Kansevari, Ranshevari—; *Mundari:* Caipijang, Loeongsokoe—; *Nasirabad:* Manjhandri—; *North-Western Provinces:* Dhandain—; *Punjab:* Jaintar, Jhanjhan, Jhinjan—; *Sanskrit:* Itakata, Jayanti, Solo—; *Sind:* Gadoreji—; *Tamil:* Mudchembai, Nirchembai—; *Telugu:* Ettajenga—; *Uriya:* Tentua—.

3. **Sesbania grandiflora** Pers. Syn. II (1807) 316.—PLATE 305.

Tall slender tree, 6-9 m. high, 20-25 cm. through. Leaves 15-30 cm. long; leaflets 16-30 pairs, linear-oblong. Racemes 2.5 cm. long. Flowers 2-4, white. Corolla 7.5-8.8 cm. long. Pods 50 cm. long.

Distribution: Indigenous from Malaya to N. Australia; cultivated in many parts of India.

The root removes " vata ", " kapha ", and inflammation.—The bark is astringent.—The leaves have a sharp bitter, sweet taste; indigestible, anthelmintic, alexeteric; cure " kapha ", itching, leprosy, night blindness, epilepsy, gout; useful in ophthalmia.—The flowers are cooling and improve the appetite; cure " vata ", quartan fever, night blindness; useful in ozoena, bronchitis, gout, and biliousness.—The fruit is bitter and acrid; alexeteric, laxative; cures " tridosha " fevers, pains, bronchitis, anaemia, tumours; allays thirst; improves taste; brightens the intellect (Ayurveda).

The leaf is tonic and antipyretic; cures night blindness and biliousness (Yunani).

The root of the red-flowered variety, rubbed into a paste with water, is applied in rheumatism. From 1 to 2 tolas of the root-juice are given with honey as an expectorant in catarrh. A paste made of the root, with an equal quantity of stramonium root, is applied to painful swellings.

The bark is very astringent and is recommended as a tonic. An infusion is given in small-pox. In Cambodia it is used in diarrhœa, dysentery, and paludism.

In cases of snake-bite the bark of the white-flowered variety ground with water is administered internally (Bapat).

In Bombay, the juice of the leaves or flowers is a popular remedy in nasal catarrh and headache; it is blown up the nostrils and causes a very copious discharge of fluid, relieving the pain and sense of weight in the frontal sinuses.

A poultice of the leaves is a popular remedy in Amboyna for bruises. The juice of the flowers is squeezed into the eyes to relieve dimness of vision (Murray).

In Cambodia the flowers are considered emollient and laxative.

The bark is useless in the antidotal treatment of snake-bite (Mhaskar and Caius).

Bengal: Agasti, Agusta, Bagfal, Bak, Buka, Buko—; *Berar:* Hadga, Heta—; *Bombay:* Agasta, Agusta, Basna—; *Burma:* Paukhya, Paukpan—; *Cambodia:* Angkea dey—; *Canarese:* Agase, Bakapushpa, Kempagase—; *Gujarati:* Agathio—; *Hindi:* Agasti, Agust, Agusta, Bak, Basna, Hatiya—; *Indo China:* Angkeas day chhmol, So dua—; *Konkani:* Aghasti—; *Malayalam:* Akatti—; *Marathi:* Agasta, Agasti, Agastiya, Agathi, Agati, Chopchini, Shevari—; *Mundari:* Agastidaru—; *North-Western Provinces:* Basna, Bako—; *Sanskrit:* Agasti, Agastya, Dirghaphalaka, Dirghashimbi, Kanali, Kharadhvansi, Munidruma, Munipriya, Munipushpa, Munitaru, Pavitra, Raktapushpa, Shighrapushpa, Shuklapushpa, Sthulapushpa, Surapriya, Vaka, Vakrapushpa, Vangasena, Vranapaha, Vranari—; *Sinhalese:* Katurumurunga—; *Tagalog:* Caturai—; *Tamil:* Acham, Agatti, Kariram, Muni, Peragatti, Sevvagatti—; *Telugu:* Agise, Avise, Bakapushpam, Ettagise, Sukanasamu, Tellayavise—; *Tulu:* Agase—; *Urdu:* Agast—; *Uriya:* Buko, Ogosti—; *Visayan:* Gauay-gauay—.

ASTRAGALUS Tourn. ex Linn.

Herbs or undershrubs. Leaves pinnate, the rhachis terminating either in a leaflet or a spine; stipules free or adnate to the petiole

or united into one leaf-opposed one. Calyx tubular or campanulate; teeth 5, subequal. Petals usually with rather long claws; standard erect, ovate-oblong or panduriform; wings oblong; keel equalling the wings or a little shorter, obtuse. Stamens diadelphous; anthers uniform. Ovary sessile or stalked, many-ovulate; style filiform, straight or incurved, not bearded; stigma small, terminal. Pod linear or oblong, usually turgid, continuous within or more or less completely longitudinally 2-celled from the introversion of the inferior suture. Seeds usually reniform. Species 1600.—Cosmopolitan, except Australia.

A. Annual weeds with basifixed hairs, small yellow flowers in usually dense heads and glabrous stigmas
  1. Pod short, linear-oblong, densely pubescent, 10-12-seeded .... 1. *A. tribuloides.*
  2. Pod long, cylindrical, glabrous, 16-18-seeded .... 2. *A. hamosus.*
B. Low shrubs with basifixed hairs. Stipules adnate at the base to the petiole
  Leaflets persistently densely silky .... 3. *A. multiceps.*
C. A low shrub with basifixed hairs, indurated spiny leaf-rhachis, caducous leaflets and sessile calyx narrowed equally to the base .... 4. *A. strobiliferus.*

Numerous species belonging to this genus yield a gummy matter having the properties of tragacanth.

Therapeutically the genus is considered emollient, demulcent, and lactagogue. The root is often used as a diuretic and diaphoretic; and is credited with antisyphilitic properties.

The following species are used medicinally in Europe—*A. exscapus* Linn., *A. glaux* Linn., *A. glycyphyllos* Linn.—; in China—*A. henryi* Oliver, *A. hoantchy* Franch.—; in Indo China—*A. reflexistipulus* Miq., *A. sinicus* Linn.—; in Malaya—*A. hoantchy* Franch.—.

OFFICIAL:—The gummy exudation from *Astragalus spp.* (Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Japan, Norway, Russia, Sweden, Switzerland, Turkey, United States); *A. gummifer* Labill. (Belgium, France, Great Britain, Spain, United States); *A. poterium* Vahl. (Portugal); *A. verus* Oliv. (Portugal); *A. ascendens* Boiss., *A. gummifer* Labill., *A. brachycalix* Fischer, etc. (Spain); *A. verus* Oliv., *A. creticus* Lamk, *A. adscendens* Boiss., *A. gummifer* Lab., ecc. (Italy).

1. **Astragalus tribuloides** Del. Fl. Aegyt. Ill. 70 (non Kotschy).—Plate 306C.

An annual herb, 3-10 cm. high or more, appressed-silky, branching from the neck; branches prostrate. Leaflets 6-10 pairs, elliptical oblong, crowded. Heads 3-6-flowered, axillary, sessile or nearly so; flowers 1 cm. long; calyx tubular, teeth awl-shaped. Pods appressed-hairy, 1 cm. long, oblong-triangular, slightly curved, acutish, base retuse, bigibbous.

Distribution: Punjab.—Afghanistan to Egypt and Canaries.

The seeds are used as a demulcent.

Kharan: Kahurkah—; *Punjab:* Ogai—.

2. **Astragalus hamosus** Linn. Sp. Pl. (1753) 758.—Plate 306A.

An annual herb, 30-40 cm. high or more, appressed-pubescent, diffuse or erect. Leaflets 8-12 pairs, oblong to cuneate-oblong and linear, retuse. Racemes very short, axillary, 4-8-flowered; peduncles longer or shorter than the leaves. Pods spreading, oblong-linear, terete, 2 cm. long, 3 mm. thick, semilunar.

Distribution: Punjab.—Orient, Mediterranean, Canaries.

The plant is aphrodisiac, galactagogue and emmenagogue, maturant, pectoral, antiperiodic, diuretic, stomachic; allays thirst; heals wounds and ulcers; good in disorder of the brain and inflammation of the eye; useful in enlargement of the spleen and pain in the liver; cures leucoderma.—The juice of the leaves is good for earache.—The fruit is of many kinds; bitter bad taste; tonic; lessens inflammation; good for intestinal troubles, headache, paralysis, bronchitis.—The oil is tonic; good for paralysis and cold in the head (Yunani).

The plant has emollient and demulcent properties, and is useful in the irritation of the mucous membranes.

It is laxative and used in nervous affections; made into a paste with vinegar it is employed externally in headaches. It is said to be lactagogue and to be used in catarrhal affections.

Arabic: Asabeaulmalik, Elkoren, Iklilulmalik—; *Bombay:*

Akhlilelmalik—; *Hindi:* Katila, Parang, Purtuk, Tajebadshah—; *Persian:* Giyaheqaisar—; *Punjab:* Akhilulmalik—; *Urdu:* Nakhunah—.

3. **Astragalus multiceps** Wall. Cat. no. 5237.—PLATE 306B.

Tufts densely congested, armed with the very crowded ascending old leaf-rhachises, which are 3.8-7.5 cm. long. Stipules 6 mm., lanceolate, adnate only at the very base; leaflets 21-31, mostly crowded, obovate-oblong, 2-4 mm. long, thick in texture, dull green, clothed with grey silky hairs. Flowers 1-2, together in leaf-axils usually not peduncled. Pedicels 2-3 mm.; bracts linear, exceeding the pedicels. Calyx 10 mm., thinly silky; teeth linear-setaceous, half as long as the tube. Corolla 2 cm., twice as long as the calyx; standard exceeding wings and keel. Pod sessile, oblong, turgid, bilocular, 12-14-seeded, clothed with fine grey silky hairs.

Distribution: W. Himalayas in the temperate zone, 10,000—12,000 ft., Garhwal, Kumaon.

The seeds are given for colic, and also for leprosy (Stewart).

Afghanistan: Diddani, Tinani—; *Punjab:* Kandei, Kandiara, Katarkanda, Pisar, Sarmul—.

4. **Astragalus strobiliferus** Royle Ill. 199. Camb. in Jacq. Voy. Bot. 39, t. 47.

A much-branched undershrub, densely armed with the spine-tipped, straw-coloured, 2.5-5 cm. long, axes of the leaves. Leaflets 11-13, inversely lanceolate, bluish green, stiff, pointed, 6-10 mm. long, hairy. Stipules triangular, attached to the leaf-stalk along their whole length except at the tip. Flowers few, stalkless in the axil of each leaf-stalk, scarcely exceeding the stipules. Calyx 6 mm. long, split down to the base, white-hairy. Corolla yellow, a little longer than the calyx. Petals of equal length. Standard fiddle-shaped. Pod stalkless, silky, 3- and 4- seeded.

Distribution: W. Himalaya, from Kashmir to Kunawar, 8,000—13,000 ft.

The gum is a good substitute for tragacanth.

Persian: Kon—.

Taverniera DC.

Much-branched undershrubs. Leaves few, 1- or pinnately 3- foliolate; stipules scarious; leaflets usually obovate or orbicular, exstipellate. Flowers rosy or white, in axillary lax racemes. Calyx-teeth subequal or the 2 upper more remote. Corolla much exserted; standard broadly obovate, marrowed at the base, scarcely clawed; wings small; keel about equal to the standard, obliquely truncate at the apex. Stamens monadelphous; anthers uniform. Ovary stalked; ovules usually 2; style filiform, inflexed; stigma small, terminal. Pod of 1-3 flattened indehiscent densely muricated joints. Seeds reniform.—Species 7.—N. Africa, W. Asia.

The genus is therapeutically inert.

1. **Taverniera cuneifolia** Arn. in Wight Ic. t. 1055.—*T. nummularia* Baker in Hook. f. Fl. Brit. Ind. II, 140 (non DC.).—Plate 307A (under *T. nummularia*).

A much-branched undershrub, 30-60 cm. high; branches twiggy, terete, minutely velvety-canescent. Leaves 1-foliolate; stipules scarious, triangular, acute, free, united into one deciduous one which is opposite the leaf. Leaflets very variable in size, 6-25 cm. across, orbicular or obovate, thick, glaucous, mucronulate, much longer than the petiolules; petiolules 1.5-5 mm. long. Flowers in axillary lax 2-6-flowered racemes longer than the leaves. Calyx 4 mm. long, finely pubescent; teeth triangular, acute, about equalling the tube, the 2 upper larger and more remote than the 3 lower. Corolla red, 1-1.3 mm. long; standard obovate-orbicular, slightly longer than the keel, glabrous, veined with dark purple parallel veins, emarginate. Pods with 1-2 one-seeded joints; joints ovoid, transversely and sub-reticulately rugose and echinate.

Distribution: Deccan, Gujarat, Sind, Baluchistan, Punjab.—Afghanistan, Orient.

The leaves are said to be useful in the form of a poultice as an application to sloughing ulcers to keep them clean (Murray).

Bombay: Jetimad—; *Jhalawan:* Lanti—; *Kalat:* Lanti—; *Kharan:* Rang—; *Las Bela:* Nathi—; *Porebunder:* Jedhimadh, Jedhimal—; *Saruna:* Lanti—; *Sind:* Jetimad—.

LENS Gren. & Godr.

Erect or subscandent herbs. Leaves pinnate, the rhachis ending in a bristle or tendril or in a terminal leaflet; stipules semisagittate; leaflets of 2-many pairs, entire, exstipellate. Flowers solitary or in racemes, on axillary peduncles. Calyx-lobes elongate, subequal. Standard broad; wings adherent to the keel; keel shorter than the wings. Staminal tube with an oblique mouth. Ovary subsessile, 2-ovuled; style inflexed, bearded with minute hairs in its inner face. Pod compressed, continuous within, 1-2-seeded.—Species 6.—Mediterranean and W. Asia.

L. esculenta Moench. is used medicinally in many European countries.

1. **Lens esculenta** Moench. Meth. I, 31.—*Ervum lens* Linn.

A small erect softly pubescent herb, branching from the base. Leaflets of 4-6 pairs, sessile, lanceolate, often mucronate; rhachis ending in a short bristle. Racemes 2-4-flowered; peduncles about as long as the leaves, extending beyond the flowers. Calyx-teeth linear, twice as long as the tube, silky. Corolla a little longer than the calyx-teeth, pale purple. Pod rhomboid-oblong, about 1.3 cm. long, smooth. Seeds usually 2, compressed, grey, with minute spots.

Distribution: A cold weather crop throughout India.—Indigenous in S.-E. Europe and in temperate W. Asia.

The leaves are acrid and bitter.—The seed is sweet and cooling; astringent to the bowels, diuretic; improves the appetite, removes "kapha" and biliousness; but causes pain and the diseases due to "vata"; cures strangury, tumours, dysentery, skin diseases; useful in diseases of the heart and of the eyes (Ayurveda).

The seeds are indigestible, constipating, tonic, laxative; enrich the blood; useful in diseases of the chest, bronchitis, stomatitis; good for eye diseases and inflammation of the breast (Yunani).

Lentils have long held the reputation of being useful medicinally in cases of constipation and other intestinal affections. They are mucilaginous and laxative. The covering is styptic and astringent.

In many parts of Germany a decoction is given to facilitate the eruption in small-pox; and the pulse is used in the form of a paste or poultice as an application to ulcers occurring after small-pox.

A paste prepared from the seeds is a useful cleansing application in cases of foul and indolent ulcers.

Two lentils ground together with the leaves of *Azadirachta indica* are given internally in cases of snake-bite (Rasaratnakara, Vrindamadhava, Yogaratnakara).

Lentils are not an antidote to snake-venom (Mhaskar and Caius).

Afghanistan: Adah, Adas—; *Arabic:* Adas—; *Assam:* Masurmoha—; *Bengal:* Buromussur, Masuri—; *Canarese:* Chanangi, Massur—; *Catalan:* Llantia—; *Dutch:* Linze—; *English:* Lentil—; *French:* Arroufle, Avangoule, Esse, Lentille, Nantille—; *German:* Linse—; *Gujarat:* Masuridal—; *Hampshire;* Tils—; *Hebrew:* Harashim—; *Hindi:* Masur—; *Hungary:* Lencse—; *Italian:* Lenticchia—; *Jhalawan:* Adas—; *Languedoc:* Lentiho, Tsentel—; *Marathi:* Masura—; *Mundari:* Masuri, Mosari, Mosori, Musari—; *North-Western Provinces:* Masuri—; *Oxfordshire:* Dills—; *Persian:* Adas, Mirjumak, Nashik—; *Portuguese:* Lentilha—; *Punjab:* Chanching, Kerze, Manhri, Masar, Masur, Mauri, Mohi, Mohri—; *Roumanian:* Linte—; *Russian:* Tchetchevitsa—; *Sanskrit:* Gabholika, Gurubija, Halasaka, Kalyanabija Mangaliya, Masur, Masuraka, Masurika, Prithubijaka, Ragadali, Sura, Tambularaga, Vrihikanchana—; *Spanish:* Lenteja—; *Tamil:* Misurpurpur—; *Telugu:* Chirisanagalu, Misurpappu—; *Urdu:* Masur—.

ALHAGI Tourn. ex Adans.

Much-branched rigid shrubs armed with axillary spines (abortive branches or peduncles). Leaves simple, quite entire, usually small; stipules small. Flowers red, usually few, in axillary racemes. Calyx campanulate; teeth short, subequal. Corolla exserted; standard obovate, with a short claw; wings falcate-oblong, free; keel incurved, obtuse, about equalling the standard and the wings. Stamens diadelphous; anthers uniform. Ovary stalked; ovules many; style filiform, incurved, glabrous; stigma small, terminal. Pod linear, jointed, somewhat thick, subterete or compressed, smooth, indehiscent, usually contracted between the seeds; joints not separating. Seed reniform.—Species 3.—Mediterranean, W. Asia.

A. camelorum Fisch. is used medicinally in Egypt, Syria, Persia, and China.

1. **Alhagi camelorum** Fisch. Ind. Hort. Gorenk. ed. 2 (1812) 72.—*A. Maurorum* Baker in Hook. f. Fl. Brit. Ind. II, 145.—Plate 307B (under *A. Maurorum*).

A low erect shrub, armed with copious hard sharp spines reaching sometimes 3.8 cm. long; branches terete, striate, glabrous or nearly so. Leaves simple, coriaceous, 6-10 by 3-4.5 mm., obovate-oblong, obtuse, apiculate, glabrous or puberulous, base cuneate; petioles very short; stipules minute, subulate. Flowers 5-8 on a spine; pedicels short, slender. Calyx glabrous, 4 mm. long; teeth short, triangular. Corolla a little more than twice as long as the calyx; standard 8 mm. long by 5 mm. broad, obovate-oblong, auricled at the base above the claw, glabrous. Ovary glabrous. Pods 2-3.2 cm. long, usually falcate, more or less contracted between the seeds, glabrous. Seeds blackish brown, smooth, polished.

Distribution: S. M. Country, Gujarat, Sind, Baluchistan, N. and N.-W. India.—Persian Baluchistan, Arabia, Egypt.

The plant is bitter and acrid with a distinct flavour; refrigerant, digestible, antipyretic, tonic, laxative, diuretic; removes "vata", "kapha", excess of fat; cures brain affections, leprosy, skin diseases, bronchitis; allays thirst and improves appetite; useful in epistaxis (Ayurveda).

The plant has a bitter bad taste; alexeteric, maturant, aperient, attenuate; good for piles, opacities of the cornea, and hemicrania. —An oil from the leaves is used for rheumatism.—The flowers are good for piles.—The manna is aperient, cholagogue, expectorant, diuretic, fattening, aphrodisiac; purifies the blood; good in vomiting, small-pox eruptions, asthma, and piles; it has a slightly bad taste (Yunani).

In the Konkan, the plant is smoked along with black datura, tobacco, and ajwan seeds as a remedy for asthma.

The infusion has a diaphoretic action.

In Ormara a decoction of the root is made and used externally for swellings, abscesses, and put into the water for bathing (Hughes-Buller).

Arabic: Aagul, Alhaju, Haj, Shoukuljamal—; *Baluchistan:* Kahribuz, Shutharkhar—; *Bengal:* Dulallabha, Javasha—; *Bombay:* Jawassa, Jawassi—; *Canarese:* Ballituruche, Toreyingalu—; *Chinese:* Tz'u Mi—; *Cutch:* Zuwasha—; *English:* Arabian Manna Plant, Camel Thorn, Persian Manna Plant—; *French:* Agoul, Alhagi, Halhagi, Plante épineuse—; *Gandava:* Kandar, Kandeira—; *Gujerati:* Javaso—; *Hindi:* Javansa, Javasa, Jawasa, Junwasa, Juwasa, Yavasa—; *Kharan:* Shinz—; *Kila Saifulla:* Ghaz, Makhe—; *Kohlu:* Tandan—; *Laleji:* Shinz—; *Las Bela:* Shinz—; *Loralai:* Tanwan—; *Malayalam:* Kappattumpa—; *Marathi:* Jawas, Kantechumbaka, Kas, Yawas—; *Ormara:* Shinz—; *Persian:* Kharebuz, Kharishutr, Shutarkhar, Ushtarkhar—; *Sanskrit:* Adhikantaka, Ananta, Bahukantaka, Balapatra, Duramula, Durlabha, Dusparsha, Dhirghamula, Gandhari, Girikarnika, Kachhura, Kantakaluka, Kantaki, Kshudrengudi, Marudbhava, Rodanika, Samudranta, Sukshmapatra, Tikshnakantaka, Triparnika, Vanadarbha, Vasanta, Vishaghna, Vivarnaka, Yas, Yavasa, Yavasaka—; *Sibi:* Kandera, Tindan, Zoz—; *Sind:* Kas, Kaskhandero, Usturkhar—; *Telugu:* Girikarnika, Tellaginiya——; *Urdu:* Athariyun, Farakiyun, Javasa—; *Zhob:* Zoz—.

Zornia Gmel.

Herbs. Leaves digitately 2-4-foliolate; stipules subfoliaceous, often punctate. Leaflets usually dotted, exstipellate. Flowers in lax racemes; peduncles terminal and axillary; bracts twin, lateral, nerved, of the same form as the stipules but larger and broader, each pair enclosing a sessile flower. Calyx small, membranous; the 2 upper teeth connate. Corolla much exserted; standard suborbicular, clawed; wings obliquely obovate or oblong; keel incurved, subrostrate. Stamens monadelphous; anthers dimorphous. Ovary sessile; ovules many; style filiform; stigma small; terminal. Pod jointed, compressed, the upper suture nearly straight, the lower deeply sinuate; joints easily separable, smooth or echinate, indehiscent, flattened, 1-seeded.—Species 12.—Tropics, especially America.

Z. diphylla Pers. is used medicinally in Nigeria, *Z. tetraphylla* Mich. in South Africa.

1. **Zornia diphylla** Pers. Syn. Pl. II (1807) 318; Benth. in Mart. Fl. Bras. XV, 80, t. 21-2.

Annual, much-branched, 20-38 cm.; branches prostrate or ascending, glabrous or puberulous. Leaves 2-foliolate; petioles 6-20 mm. long; stipules 10 mm. long, lanceolate, acute, strongly nerved, produced below the insertion into a triangular spur. Leaflets variable in size and shape, 13-28 by 3-16 mm., sessile, often unequal-sided, lanceolate, linear-lanceolate or occasionally linear, dotted with black glands beneath, glabrous, rigid. Flowers small, in 3-12-flowered spicate racemes 2.5-10 cm. long; peduncles slender, terete; bracts foliaceous, reaching 13 mm. long, ovate-lanceolate, acute, ciliate, sprinkled with black dots, produced below the insertion into a triangular spur, strongly nerved from the base, completely enclosing the flower and often the entire pod. Calyx membranous, 3 mm. long, the 2 upper teeth broad, obtuse, deeply connate, ciliate at the apex, the 2 lateral teeth smaller, deltoid, the lowest tooth the longest, lanceolate, acute, ciliate. Corolla twice as long as the calyx; standard orbicular, with a long claw. Pods 1-6-jointed, either quite enclosed by the bracts or exserted; joints about 2 mm. long, compressed, indehiscent, covered with numerous short straight fulvous spines.

Distribution: Everywhere in the tropics.

The root is given to induce sleep in children.

Hausa: Sabulunkuyangi, Sabulunsallo—; *Malayalam:* Nelammari—; *Mundari:* Kurkiatasad, Luduludiatasad—; *Santali:* Birmoch, Taudijhapni—.

Smithia Ait.

Herbs or undershrubs. Leaflets many, small, sensitive, leaf-rhachis ending in a bristle; stipules scariose, with large auricles. Flowers racemose or axillary. Calyx deeply 2-lipped, the lips usually entire. Corolla exserted; standard orbicular; keel incurved obtuse. Stamens in two bundles of 5 each; anthers uniform. Ovary linear,

many-ovuled; style incurved, filiform, stigma, minute capitate. Pod of few or many minute flattened or turgid joints, folded together inside the calyx.—Species 35.—Tropical Asia, Africa.

Stems not bristly
Flowers yellow
1. Flowers 1 or 2 in the axils of leaves which are crowded at the ends of the branches .... 1. *S. conferta.*
2. Flowers in short simple racemes .... 2. *S. sensitiva.*

S. sensitiva Ait., and *S. strigosa* Benth. are used medicinally in Madagascar.

1. **Smithia conferta** Sm. in Rees Cyclop. XXXIII (1819) no. 2.—*S. geminiflora* Roth Nov. Pl. Sp. (1821) 352.

Annual, 60-120 cm. high; stems not bristly; branches long, virgate, straggling, smooth, with long internodes below. Leaves small, nearly sessile, abruptly-pinnate; rhachis 6-13 mm. long; stipules very large, scarious, lanceolate, acute, with very long acuminate or lacerate auricles. Leaflets subsessile, 2-8 pairs, those of the stem-leaves 6-10 by 3 mm., those of the upper or floral leaves narrower, about 1.6 mm. broad, all linear-oblong, obtuse or subacute, densely bristly on the margins and on the midrib beneath. Flowers solitary or 2, in the axils of the upper leaves which are crowded at the ends of the branches so as to form a congested head; pedicels very short, hairy; bracteoles scarious, 4 mm. long, elliptic-oblong, acute, with a long bristle at the apex and a few long bristles at the back. Calyx 5-6 mm. long, veins close, parallel; lips equal, oblong, acute, with a few long bristles at the apex and on the back. Corolla yellow, 8-11 mm. long. Pods 3-6-jointed; joints small turgid, papillose.

Distribution: Throughout India, Ceylon,—Java, N. Australia.

The plant has laxative properties. It is used in biliousness, rheumatism, ulcers, and sterility in women.

2. **Smithia sensitiva** Ait. Hort. Kew. III (1789) 496.

Annual, diffuse, much-branched; stems 30-90 cm. long, slender, not bristly. Leaves abruptly-pinnate; rhachis 1.3-2.5 cm. long, bristly and ending in a long bristle; petioles short; stipules scarious, lanceolate, prolonged below the insertion into long cuspidate or

lacerate auricles. Leaflets 3-10 pairs, 6-13 mm. long, linear-oblong, obtuse, bristle-pointed, glabrous above and with strong bristles on the midrib and somewhat straight margins beneath, base rounded, somewhat unequal-sided. Flowers 2-6, in simple racemes from the axils of the upper leaves; peduncles 8 mm. long, slender, glabrous or with a few scattered bristles; pedicels filiform, ascending; bracteoles scarious, 4-5 mm. long, ovate, acute, bristle-pointed. Calyx 6-8 mm. long, with a few scattered bristles, rigid; veins close, parallel, simple; lips equal, entire, acute. Corolla yellow, 10 mm. long. Pods flattened; joints 4-6, orbicular, margined, densely papillose on the faces.

Distribution: Throughout India, Andamans, Nicobars.—Tropical Africa, Madagascar, Java, China.

In Madagascar the plant in the form of lotion is used for headache.

Bengal: Nullakashina—; *Hindi:* Odabrini—; *Sakalave:* Tsingilongilondrano—.

Ormocarpum Beauv.

Shrubs. Leaves with odd-pinnate exstipellate leaflets and persistent striated stipules and bracts. Flowers in lax racemes. Calyx-tube campanulate; 2 upper teeth deltoid; 3-lower lanceolate. Standard broad; keel much incurved, not at all beaked. Stamens in two bundles of 5 each; anthers uniform. Ovary linear, few-ovuled; style filiform, inflexed, stigma minute terminal. Pod of a few indehiscent turgid linear or oblong joints, the lower seedless, the faces rugose, naked or muricated with weak gland-tipped prickles. —Species 10.—Tropics and subtropics.

The genus is therapeutically inert.

1. **Ormocarpum sennoides** DC. Prodr. II, 315; Wight Ic. t. 297.

A small, rather straggling, branching shrub, with smooth pale bark and slender twigs. Leaves spreading, rhachis 3.2-6.3 cm., usually rough with minute prickles, stipules small, triangular, sharply acuminate, striate, persistent; leaflets 9-15, usually alter-

nate, shortly stalked, oval-oblong, rounded at both ends, apiculate, glabrous, pale beneath. Flowers few, rather small, nodding on slender hispid pedicels, about 3 in small hispid and glandular racemes, much shorter than leaves. Calyx somewhat hispid-glandular, or nearly glabrous, segments acute. Pod 2.5-5 cm., long-stalked, moniliform, beaked, much contracted between the oblong-ovoid joints, joints 1-4 longitudinally striate, muriculate and viscous with glands.

Distribution: W. India, Ceylon.—Siam, Philippines, Polynesia, tropical Africa.

The root is tonic and stimulant. It is used in paralysis and lumbago.

Canarese: Kadunugga—; *Malayalam:* Kattumurinna, Punamurinna—; *Sanskrit:* Kananashekhara, Kananashigru—; *Tamil:* Kattumuringai—; *Telugu:* Adavimunaga, Gunnangi, Nallakasana—.

PSEUDARTHRIA W. & A.

Herbs or undershrubs, villous or viscidly-pubescent. Leaves pinnately 3-foliolate; stipules free, membranous or striate. Leaflets large, stipellate. Flowers small, twin or fascicled along the rhachis of a terminal or axillary racemes or panicle; bracts narrow. Calyx-teeth as long as the tube, the 2 upper subconnate. Corolla much exserted; standard suborbicular; wings oblique, oblong; keel obtuse. Stamens diadelphous; anthers uniform. Ovary subsessile; ovules many; style inflexed, subulate; stigma small, terminal. Pod linear-oblong, flat, continuous within, not jointed, the faces transversely veined. Seeds compressed, subreniform. Habit of Desmodium, from which it differs in pod.—Species 5.—Africa, tropical Asia.

The genus is therapeutically inert.

1. **Pseudarthria viscida** W. & A. Prodr. (1834) 209.

Perennial, diffuse, prostrate; stems 60-120 cm. long, slender, more or less clothed with soft whitish hairs. Leaves 3-foliolate; petioles 1.3-2.5 cm. long, densely hairy; stipules 4.5-6 mm. long, lanceolate-cuspidate, hairy. Leaflets stipellate, the terminal 4.5-9 by 3.8-5 cm., rhomboid-ovate, the lateral 3.2-4.5 by 2.2-3.2 cm., obliquely ovate-oblong or subrhomboid, all more or less hairy above, densely grey-silky beneath; stipels filiform, often 3 mm. long. Flowers

small, numerous, in distant fascicles along the rhachis of terminal and axillary racemes or panicles; peduncles 1-3; pedicels filiform, spreading, much longer than the calyx; bracts lanceolate-subulate, shorter than the pedicels. Calyx 2.5 mm. long, hairy; teeth as long as the tube, the 3 lower linear-subulate, the 2 upper shorter, sub-connate. Corolla 4 mm. long. Pods 16-22 by 6-8 mm., linear-oblong, flattened, clothed on the faces with fine hooked viscous hairs, densely ciliate on the margins, one on both sutures often slightly indented between the seeds. Seeds 4-6, subreniform, compressed, brownish black.

Distribution: Tropical zone, W. Peninsula, Ceylon, Timor.

The plant is used in biliousness, rheumatism, excessive heat and fever, asthma, heart diseases, piles and worms.

Sanskrit: Sanaparni—; *Telugu:* Muyyakuponna, Nayakuponna—.

URARIA Desv.

Herbs or undershrubs. Leaves pinnately 3-9-foliolate or the lower rarely 1-foliolate; stipules free, acuminate, striate at the base. Leaflets often large, stipellate. Flowers in terminal racemes; bracts ovate or lanceolate, acuminate; bracteoles 0. Calyx-tube very short; the upper teeth short, the 3 lower elongated. Corolla purple or yellow; standard orbicular or obovate, narrowed into a claw; wings falcate-oblong, adhering to the keel; keel slightly incurved, obtuse. Stamens diadelphous; anthers uniform. Ovary sessile or shortly stalked; ovules 2-many; style filiform, inflexed above; stigma capitate, terminal. Pod of 2-6 small turgid 1-seeded joints folded on one another within the calyx. Seeds orbicular or sub-globose.—Species 12.—Palaeotropics.

A. Upper leaves 5-9-foliate .... 1. *U. picta.*
B. Leaves 1- and 3- foliolate intermixed
   1. Stems trailing .... 2. *U. lagopoides.*
   2. Stems erect .... 3. *U. hamosa.*

U. picta Desv. is used medicinally in the Gold Coast.

1. **Uraria picta** Desv. Journ. Bot. I (1813) 123, t. 5, fig. 19. —*Doodia picta* Roxb. Fl. Ind. III (1832) 368.—PLATE 308A.

A suffruticose sparingly branched perennial 0.9-1.8 m. high;

stems stout, reaching 1.2 cm. diam. at the base, finely downy with hooked hairs. Leaves imparipinnate, 20-30 cm. long (including the petiole); petioles 3.8-6.3 cm. long, striate, downy; stipules 1.2 cm. long, triangular, long-acuminate, striate. Leaflets on the upper part of the stem 5-7 (rarely 9), rigidly subcoriaceous, 10-20 by 1-2 cm., linear-oblong, acute, blotched with white and glabrous above, finely reticulately veined and minutely pubescent beneath, base rounded; stipels subulate, 4.5 mm. long; leaflets on the lower part of the stem 1-3-foliolate, suborbicular or oblong. Flowers in close fascicles along the rhachis of spicate cylindric racemes 15-30 cm. long, 1.6-2 cm. broad; rhachis and pedicels downy with hooked hairs; pedicels 6-10 mm. long, curved upwards after flowering so that the pods are in contact with the rhachis; bracts large, scarious, striate, strongly ciliate, the upper lanceolate-acuminate, the lower ovate-acuminate completely concealing the buds, soon deciduous. Calyx 4 mm. long; teeth plumose, subulate, much longer than the tube. Corolla 6 mm. long, purple. Pods glabrous, pale lead-coloured; joints 3-6, smooth, polished, seed-like, 3 by 2 mm., folded on one another.

Distribution: Throughout India; Ceylon.—Tropical Africa, Malay Islands, Philippines.

The fruit is applied to the sore mouths of children.

The plant is supposed to be a good antidote to the venom of *Echis carinata.*

The plant is not an antidote to snake venom (Mhaskar and Caius).

Awuna: Amewoyibalege—; *Bengal:* Sankarjata—; *Bombay:* Prisniparni—; *Gujarat:* Pilavan, Pitavan, Pitvan—; *Hausa:* Kaskaifi—; *Hindi:* Dabra, Pitvan, Shankaraja—; *Marathi:* Pitvan, Prisniparni, Ranganja—; *Porebunder:* Pilosamervo—; *Punjab:* Deterdane—; *Sanskrit:* Chitraparni, Prishthiparni—; *Sokoto:* Dakushe—; *Tamil:* Sittirappaladai—; *Uriya:* Ishworojota, Sonkorojota—.

2. **Uraria lagopoides** DC. Prodr. II, 324.—Plate 308B.

Creeping and ascending woody shrublet, 30-90 cm. long. Leaves 2.5-5 cm. long; rhachis pubescent; leaflets solitary or one pair and a larger terminal one oblong rhomboid rounded, base

truncate or cordate, thickly membranous, glabrous above, reticulate, hairy beneath, 2.5-5 cm. long, 2-2.5 cm. wide; petioles 1.2-2 cm. long. Stipules lanceolate setaceous. Racemes dense oblong, 2.5-6.3 cm. long, 2 cm. through; bracts lanceolate silky, acuminate. Calyx 3 mm. long, plumose. Corolla white. Pods glabrous, joints reticulate, 3.8 mm. long, 2 cm. wide.

Distribution: Nepal, Chota Nagpur, Bengal to Ava, Malay Peninsula.—Malay Isles, China, Polynesia, N. Australia.

The plant is hot, bitter, sweet; laxative, aphrodisiac; cures "tridosha" fevers, burning sensation, asthma, dysentery, thirst, vomiting, delirium, ulcers; good for tumours due to derangement of blood; useful in malarial fevers, eye diseases, fractures of the bones (Ayurveda).

This plant is an ingredient of the *Dashamula Kadha* and is thus much used in native medicine. It is considered alterative, tonic, and anti-catarrhal, but is seldom used alone.

According to Sushruta, it was given with milk to women in the seventh month of their pregnancy to produce abortion.

The plant is recommended for the treatment of snake-bite (Charaka), and scorpion-sting (Charaka, Sushruta).

The plant is useless in the treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

Bengal: Chakulia—; *Bombay:* Dowla—; *Hindi:* Daula, Davada, Pithauni, Pithavana, Pitvan—; *Malayalam:* Orila—; *Marathi:* Davala, Pithavana—; *Mundari:* Bilaicata, Tuiucadlom—; *New Caledonia:* Pera m'boyo—; *Sanskrit:* Anghriparni, Anghrivallika, Atiguha, Bramhaparni, Chakrakulya, Chakraparni, Chitraparni, Chitraparnika, Dhamani, Dhavani, Dirgha, Dirghaparni, Dirghapatra, Ghastila, Guha, Kadala, Kalashi, Kalasi, Kankashatru, Kroshtukamekhala, Kroshtukapuchhika, Kroshtupuchhi, Kroshtuvinna, Langali, Langulika, Mahaguha, Mekhala, Pishtaparni, Prishniparni, Prishthiparni, Prithakparni, Purnaparni, Shirnamala, Shrigalvinna, Sinhalanguli, Sinhapuchhi, Sinhapuchhika, Sinhapushpi, Srigalavanta, Tanvi, Triparni, Vishnuparni—; *Telugu:* Anghriparnika, Jibilike, Kolaponna, Nakkatokaponna—; *Uriya:* Gorykhiya, Prisnipornni—.

3. **Uraria hamosa** Wall. Cat. 5681B.

A straggling diffuse undershrub. Young parts clothed with long hairs and shorter hooked bristles. Leaves 1- and 3- foliolate; stipules acuminate from a broad semicordate base, hairy; leaflets 7.5-12.5 cm. long, round or obovate, obtuse or emarginate, rarely acute, rounded not cordate at base, glabrous above, downy beneath; stipels minute, setaceous. Racemes cylindrical, lax, copiously panicled and elongated in fruit; bracts imbricating in bud, ovate-cuspidate, hairy, deciduous; pedicels 3-4 mm., incurved at the apex, often fascicled. Calyx 4 mm., teeth subequal, deltoid-cuspidate. Pod hairy, 2-6-jointed.

Distribution: Upper Gangetic Plain, eastwards to Bengal, Sikkim and Burma, and south to Ceylon.—Malay Islands.

In Sambalpur a decoction of the leaves is used with other drugs in cases of fever (Haines).

ALYSICARPUS Neck.

Diffuse or erect herbs. Leaves 1- (rarely 3-) foliolate; stipules scarious, acuminate, free or connate. Leaflets 2-stipellate. Flowers in leaf-opposed, terminal, or axillary racemes; pedicels often twin; bracts scarious, generally deciduous. Calyx glumaceous; teeth deep, the 2 upper often connate. Corolla not or hardly exserted; standard obovate or orbicular, narrowed into the claw; wings obliquely oblong, adhering to the keel, slightly curved, obtuse, usually appendiculate. Stamens diadelphous; anthers uniform. Ovary sessile or shortly stalked; ovules numerous; style incurved; stigma capitate. Pod terete or turgid, composed of several indehiscent 1-seeded joints.—Species 10.—Warm countries of the Old World.

A. wallichii W. & A. and *A. zeyheri* Harv. are used medicinally in South Africa.

1. **Alysicarpus longifolius** Wight & Arn. Prodr. (1834) 233.

Stem stout, 1.2-1.5 m. high, ascending, terete, slightly striate, glabrous. Leaves 1-foliolate; petioles 3-10 mm. long; stipules scarious, 1-2 cm. long, lanceolate, very acute. Leaflets 5-15 by 1-2 cm., oblong or lanceolate, obtuse or subacute, glabrous above,

appressedly hairy on the nerves beneath, closely reticulately veined, the reticulations conspicuous on both surfaces, base subcordate; petiolules very short; stipels linear, acute. Flowers erect, appressed to a more or less hairy rhachis, in dense spicate racemes 15-30 cm. long; pedicels 2.5 mm. long, hairy; bracts conspicuous, often exceeding 1.2 cm. long, ovate, acuminate, more or less silky outside, ciliate, concealing the buds and falling before the flowers open. Calyx 6-15 mm. long, pubescent, ciliate, striate, as long as or longer than the 2 lower joints of the pod; tube funnel-shaped, plicate; teeth much longer than the tube, imbricate in the fruiting stage. Pods usually exserted, 10-13 by 2 mm., very shortly stalked, glabrous, terete-compressed, apiculate, slightly moniliform; joints 4-6, glabrous, reticulately veined, the veins not very conspicuous.

Distribution: Throughout the plains of India, Ceylon.

The sweet root is used as a substitute for liquorice.

Gujerati: Dhodasamervo, Motosamervo, Ubhosamervo—; *Marathi:* Jangligailia, Mothadampta—.

Arachis Linn.

Low, usually prostrate herbs with even-pinnate leaves, the leaflets 2 or 3 pairs, not stipellate. Flowers yellow, crowded in short, axillary spikes, or pedicelled in the axils of the leaves. Calyx-tube slender, the 4 upper wings oblong; keel incurved, beaked. Filaments united in a closed tube, some anthers versatile, the alternating ones subbasifixed. Pod oblong-cylindric, reticulate, indehiscent, torulose but not jointed, maturing under the surface of the ground.—Species 10.—Brazil, Paraguay.

A. hypobaea Linn. is used medicinally in Guiana and Brazil.

Official:—The oil from the seeds of *A. hypogaea* Linn. (Germany, Great Britain, Japan, Switzerland); *A. hypogaea* Linn. =*A. asiatica* Lour. and *A. africana* Lour. (Portugal).

1. **Arachis hypogaea** Linn. Sp. Pl. (1753) 741.—Plate 387.

An annual, spreading, hairy, branched herb, the stems 30-80 cm. long. Leaves 8-12 cm. long, the base of the petiole clasping,

the sheath produced in 2 linear-lanceolate stipules. Leaflets oblong to obovate, 2-5 cm. long. Flowers axillary, few, fascicled, yellow, about 8 mm. long. Pods ripening under ground, oblong, leathery, reticulate, 1-5 cm. long, containing from 1-3 seeds.

Distribution: A native of tropical America, now widely distributed in cultivation in tropical and subtropical regions.

The fruit and oil are sweet and astringent to the bowels; they cause flatulence and bronchitis (Ayurveda).

The unripe nuts are given to women whose supply of milk is insufficient for their children; they are considered a good lactagogue.

In French Guiana the oil from the seeds is given in acute abdominal pain. It is applied hot to dislocations as compresses with or without tafia.

The seeds contain an alkaloid of unknown composition, arachine.

Adang: Gigeng—; *Akim:* Nkateair—; *Ashanti:* Nkateair—; *Awuna:* Azi—; *Bacongo:* Gouba—; *Baffourou:* Zoho—; *Baga:* Aleketo—; *Banziri:* Calako—; *Baya:* M'foul—; *Bengal:* Bilatimung, Chinerbadam, Matkalai—; *Betsileo:* Voanjokatra—; *Bombay:* Bhuichane, Bhuimuga, Bhuisheng, Vilayatimug—; *Brazil:* Jarere, Mandobi, Mandubi, Mandupiliu, Manobi—; *Burma:* Maibai, Mibe, Myepe—; *Canarese:* Bhuimug, Kadale, Nelakadale, Nelgale—; *Catalan:* Cacahuet—; *Congo:* Pinda—; *Dutch:* Aardenoot, Aardepistas, Grondnoot—; *English:* Chinese Almond, Earth Nut, Goober Nut, Ground Nut, Manilla Grain, Pea Nut—; *Ewe:* Azi, Makate—; *French:* Anchic, Arachide, Arachine, Cacahuate, Cacahuete, Chataigne de terre, Fève de terre, Noisette de terre, Noix de terre, Pistache d'Amérique, Pistache de terre, Pois de terre—; *French Guiana:* Pistache, Pistache de terre—; *Ga:* Ngkatiair—; *Gaboon:* Benda—; *Gambia:* Teatura—; *German:* Erdmandel, Erdnuss, Erdpistazie—; *Greek:* Arachidna—; *Gujarat:* Bhoimag, Bhoyachena, Bhuichana, Chinimung, Mandavi—; *Haiti:* Cacahuate, Mani—; *Hindi:* Mungphali, Vilayetimung—; *Hova:* Pisitasy, Voanjomitohy—; *Imerina:* Voanjombazaha—; *Italian:* Arachide, Arachidna, Noce di terra, Pistacchia di terra—; *Kano:* Gida—; *Konkani:* Mussombibikan—; *Krepi:* Azi—; *Krobo:* Akate—; *La Reunion:* Pistache, Pistache de

terre—; *Loango:* Pinda—; *Malayalam:* Nelakkatala, Verkkala—; *Mandjia:* Karakoua—; *Marathi:* Bhuichane, Bhuimuga, Bhuisheng, Vilayatimug—; *Mundari:* Cinabadam, Ciniabadam—; *Pahouin:* Coum—; *Philippines:* Cacachuete, Mani—; *Portuguese:* Amendoim—; *Russian:* Zemlianoi orech—; *Sanskrit:* Bhuchanaka, Bhumija, Bhushimbika, Bhustha, Mandapi, Raktabija, Snehabijaka, Tribija—; *Sind:* Bhonimug Bhuimung—; *Sinhalese:* Ratakaju—; *Sokoto:* Gujiya, Gyada—; *South Africa:* Monkey Nut—; *Spanish:* Alfonsigo de tierra, Cacahuate, Cacahuete, Mani, Pistachio de tierra—; *Tagalog:* Cacauate—; *Tamil:* Nilakkadalai, Verkkadalai—; *Telugu:* Nilasanagalu, Verushanagalu—; *Twi:* Nkate—; *Yakoma:* Banya—.

OUGEINIA Benth.

Specie 1.—India.

1. **Ougeinia oojeinensis** (Roxb.) Hochr. in Bull. Soc. Bot. XIII—XIV, (1909) 51.—*O. dalbergioides* Benth. Pl. Jungh. (1851-55) 216.—PLATE 309 (under *O. dalbergioides* Benth.).

A tree 6-12 m. high, with a short crooked trunk; bark dark brown, deeply cracked; branches slender, terete. Leaves pinnately 3-foliolate, often reaching 30 cm. long (including the petiole); common petioles 3.8-5 cm. long; stipules 6 mm. long, lanceolate, acute, caducous. Leaflets rigidly coriaceous, the terminal broadly elliptic or roundish, sometimes trapezoidal, 7.5-15 by 5-10 cm., the lateral leaflets opposite, obliquely ovate, cordate, 7.5-10 by 3.8-7.5 cm., on petiolules 3 mm. long, all glabrous above, glabrous or more or less downy beneath, distantly and shallowly crenate, bluntly pointed; main nerves 4-8 pairs, prominent; stipules subulate. Flowers numerous, in short fascicled racemes from the nodes of old branches; pedicels coloured, 1.2-2 cm. long, filiform; bracts 1.25 mm. long, ovate, acuminate, broader than long, villous outside; bracteole 1 beneath the calyx, minute, villous. Calyx 4-6 mm. long, pubescent; teeth short, triangular. Corolla 1-1.3 cm. long, white or rose-coloured, somewhat fragrant. Pods 5-7.5 cm. long; joints reticulately veined, 2-3 times as long as broad.

Distribution: The sub-Himalayan tract and outer Himalayan valleys and slopes up to 5,000 ft., from the Punjab to Bhutan, Chota Nagpur, Central India, Orissa, and the Circars, the Central Provinces, Bombay, Marwar of Rajputana.

The bark is acrid and hot; anthelmintic; astringent to the bowels; cures "kapha" and "vata", dysentery, leucoderma, urinary discharges, ulcers, blood diseases, skin diseases, biliousness, burning sensation, and anæmias (Ayurveda).

Among the hill tribes of Chota Nagpur a decoction of the bark is given when the urine is highly coloured.

In the Central Provinces the bark is used as a febrifuge.

The bark when incised furnishes a kino-like exudation, which is used in cases of dysentery and diarrhœa (Lisboa).

Banswara: Tunnia—; *Bengal:* Tinis—; *Bhil:* Tewsa—; *Bombay:* Sandan, Telas, Timas, Timsa, Tunnia, Tunus—; *Canarese:* Bettahonne, Huli, Karimuttala, Malehonn, Nayihonne—; *Central Provinces:* Kala phalas, Karimattal, Tinnas, Tinsa—; *English:* Chariot Tree—; *Gond:* Ser, Shermana, Tinsai—; *Gujerati:* Bhinoharmo, Harmo, Tanasse—; *Hindi:* Asainda, Kalaphulas, Sandan, Timsa, Tinnas—; *Khandesh Dangs:* Telus—; *Kolami:* Ruta—; *Konkani:* Kurimutal—; *Koya:* Shikkudu—; *Kumaon:* Sandan—; *Kurku:* Rutok—; *Lambadi:* Eru—; *Lepcha:* Sandanpipli—; *Malayalam:* Malavenna, Nemi—; *Marathi:* Kala palas, Tanach, Tewas, Tivas—; *Nepal:* Sandan pipli—; *North-Western Provinces:* Panan, Saldan, Shanjan, Tinsa—; *Punjab:* Sandan, Sannan, Telus—; *Reddi:* Shikkudu—; *Sanskrit:* Akshaka, Ashmagarbhaka, Atimuktaka, Bhasmagharba, Chakri, Chitrakarma, Chitrakrita, Jaladhara, Meshi, Nemi, Ratha, Rathadru, Rathika, Sarvasara, Shakata, Shatanga, Spandana, Spandanadruma, Spandani, Tinashaka, Tinisha, Vanjula—; *Santal:* Rot—; *Saora:* Vanjulamu—; *Tamil:* Narivengai—; *Telugu:* Adavishikkudu, Atimuktamu, Badanegi, Dargu, Mandamotuku, Nemmi, Tellamotuku, Tinisavriksha, Vanjulamu—; *Uriya:* Bandhono—.

DESMODIUM Desv.

Herbs or shrubs, rarely small trees. Leaves pinnately 1-3-, rarely 5- foliolate; stipules free or united into a single leaf-opposed

one; stipellate. Flowers usually in dense racemes, sometimes in axillary umbels or fascicles. Calyx-tube short, campanulate or turbinate, the 2 upper teeth more or less connate, the 3 lower acute or acuminate. Corolla exserted; standard obovate or orbicular; wings more or less adhering to the keel; keel-petals incurved, sometimes spurred towards the claw. Stamens usually diadelphous, 9 and 1, sometimes monadelphous, sometimes with the vexillary filament free in the upper half. Ovary sessile or stalked, 2-many-ovuled; style incurved. Pod of several 1-seeded usually indehiscent joints, more rarely dehiscent along one suture.—Species 170.—Tropics and subtropics.

A. Shrubs with woody branches, 3-foliolate. Flowers umbellate .. 7. *D. pulchellum.*
B. Erect herbs or under-shrubs with large 1-3-foliolate leaves
 I. Joints of pod indehiscent, once or twice as long as broad .... 1. *D. tiliaefolium.*
 II. Joints of pod as in the last group but the calyx-teeth narrower and longer
  a. Leaflets oblong, usually 7.5-15 cm. long .... 2. *D. gangeticum.*
  b. Leaflets cordate or truncate, 7.5-15 cm. long .... 5. *D. lasiocarpum.*
 III. Joints of pod small, as long as broad, upper suture straight, lower slightly constricted
  a. Pod 10-13 mm. long, obscurely hairy, 3-5-jointed .... 6. *D. retroflexum.*
  b. Pod 13-20 mm. long, glabrescent or minutely downy, 5-8-jointed .... 3. *D. polycarpum.*
C. Trailing herbs with small trifoliolate stipellate leaves .... 4. *D. triflorum.*

The genus exhibits tonic, diuretic, febrifuge, and anticatarrhal properties. The roots are often mucilaginous, emollient, laxative, and antidysenteric.

The following species are used medicinally in Indo China—*D. retroflexum* DC.—; in the Gold Coast—*D. adscendens* DC., *D. Latifolium* DC., *D. triflorum* DC.—; in Madagascar—*D. barbatum* Benth. & Oerst., *D. mouritianum* DC.—; in La Reunion—*D. mauritianum* DC.—; in Guiana—*D. guianense* DC.—.

1. **Desmodium tiliaefolium** G. Don Gen. Syst. II, 297.—Plate 310A.

A deciduous shrub 1.5-4.5 m. high, with stems up to 7.5 cm. diam. Bark fairly smooth, pale grey with minute lenticels. Blaze 6 mm., pinkish, fibrous. Leaves 3-foliolate. Petiole up to 12.5 cm. long. Leaflets orbicular, ovate or obovate, base cuneate or rounded.

apex obtuse or abruptly short-acuminate, margins sinuate, glabrous or sparsely hairy above, glabrous or tomentose beneath. Terminal leaflet up to 10 by 8.8 cm., the lateral smaller and oblique. Stalk of terminal leaflet 1.2-2.5 cm. long, petiolules of the lateral 2.5-5 mm. long. Flowers pale lilac or mauve, 1-1.5 cm. long, in terminal lax much-branched often leafy panicles up to 30 cm. long. Pedicels slender, 5-7.5 mm. long. Pod 3.8-6.3 by 0.6 cm., thin, flat, thinly adpressed-hairy, composed of 6-9 joints.

Distribution: Along the Himalayas from the Upper Punjab to Tavoy, temperate and tropical regions up to 9,000 ft.

The roots are bitter and hot with a bad taste; tonic to the chest and the brain, carminative; useful in urethral discharges, stuttering; reduce oedema; cure piles, bad smell of ozoena, ophthalmia, lumbago, amenorrhœa; improve the appetite and the teeth; enrich the blood; good for scorpion-sting (Yunani).

The root is used as a diuretic, and is prescribed in bilious complaints.

Arabic: Sadkoofi—; *Hindi:* Chamkat, Chamra, Chamyat, Gurshagal, Laber, Marara, Martan, Motha, Murt, Muss, Pri, Sambar, Shamru—; *Jaunsar:* Martoi, Matoi—; *Kangra:* Bre, Kathi—; *Kumaon:* Chamlai—; *Lepcha:* Mangyep—; *Murri:* Kalanchi—; *Nepal:* Sarkinu—; *Persian:* Mushkzamin—; *Punjab:* Chamra, Chamyar, Dudshambar, Gurkats, Kalimort, Kathi, Laber, Marara, Pirhi—; *Simla:* Laber—; *Urdu:* Nagarmotha—.

2. **Desmodium gangeticum** DC. Prodr. II (1825) 327; Wight Ic. t. 271.—*D. collinum* Roxb.; Wight Ic. t. 272.—Plate 311.

An undershrub 0.6-1.2 m. high; stems irregularly angled, glabrescent; branches angled, clothed with appressed white hairs. Leaves 1-foliolate; petioles 1-2 cm. long; stipules scarious, 6-8 mm. long, linear-subulate, striate at the base. Leaflets membranous, 9-12.5 by 3.5-6.3 cm., ovate-oblong, acute or slightly acuminate, the margins somewhat waved, glabrous and green above, paler and clothed with dense soft whitish appressed hairs beneath, reticulately veined, base rounded, truncate or subcordate; main nerves 8-12 pairs; petiolules 1.5 mm. long, hairy; stipels 3 mm. long, subulate. Flowers in copious ascending terminal and axillary racemes 15-30 cm. long,

arranged in few-flowered fascicles along a slender pubescent somewhat angular rhachis; pedicels 4-6 mm. long, filiform, pubescent; bracts subulate, 1.5-3 mm. long; bracteoles minute. Calyx 2 mm. long, hairy; teeth triangular, longer than the campanulate tube. Corolla 4 mm. long, violet or white; standard 3 mm. broad, cuneate at the base. Pods subfalcate, 12-20 by 2 mm., deeply indented on the lower, slightly indented on the upper edge; joints 6-8, longer than broad, indehiscent, sparsely clothed with minute hooked hairs, the lower edge rounded, the upper straight.

Distribution: Outer Himalaya, up to 5,000 ft. and throughout India to Ceylon and Burma, Malay Peninsula.—Malay Islands, China, Philippines and tropical Africa.

The root is hot and bitter, indigestible; alterative, aphrodisiac, anthelmintic, fattening, astringent to the bowels; cures typhoid and other fevers, fevers due to mental disorders, "vata", urinary discharges, piles, inflammations, asthma, bronchitis, "tridosa", thirst, vomiting, dysentery; alexipharmac; removes "kapha" and biliousness; prevents the death of the fœtus in the womb; used in hemicrania (Ayurveda).

The root is astringent in diarrhœa, tonic; cures biliousness; useful in chronic fevers, chronic affections of the chest and lungs, vomiting, nausea (Yunani).

The plant is considered antipyretic and anticatarrhal.

The root is prescribed in combination with other drugs for the treatment of snake-bite (Sushruta, Sharangdharasamhita) and scorpion-sting (Charaka, Sushruta).

The root is not an antidote to snake-venom (Mhaskar and Caius), and is useless in the treatment of scorpion-sting (Caius and Mhaskar).

Bengal: Salpani—; *Bombay:* Daye, Salparni, Salwan—; *Canarese:* Murelehonne—; *Gujerati:* Salwan—; *Hindi:* Salpan, Salpani, Salun, Salwan—; *Malayalam:* Pullati—; *Marathi:* Darh, Ranbhal, Salparni, Salwan—; *North-Western Provinces:* Pustboeni—; *Porebunder:* Ekapanipanddhiyo—; *Punjab:* Shalpurhi—; *Sanskrit:* Anshumati, Astamati, Devi, Dhruva, Dirghamula, Dirghanghni, Dirghapatra, Dirghapatrika, Ekamula, Guha, Kitavinashini, Kumuda, Nishchala, Patini, Pivari, Sarvanukarini, Saumya, Shalani, Shalidala, Shaliparni, Shalipatri, Shophaghni,

Shothaghni, Shubhapatrika, Sthira, Subhagam, Sudala, Sudha, Suparni, Suparnika, Supatri, Surupa, Tanvi, Triparni, Vataghni, Vidari, Vidarigandha, Vrihiparnika—; *Santal:* Tandibhedi-janetet—; *Tamil:* Pulladi—; *Telugu:* Gitanaram, Kolakuporna, Nallanelapariki, Peddantrinta—; *Urdu:* Shalwan—; *Uriya:* Salopornni—.

3. **Desmodium polycarpum** DC. Prodr. II (1825) 334.—*Hedysarum purpureum* Roxb. Fl. Ind. III (1832) 358.—PLATE 312.

An erect or suberect undershrub 0.6-1.5 m. high; branches woody, slightly angular, slender, clothed upwards with short grey appressed hairs. Leaves 3-foliolate; petioles 1.5-2.5 cm. long, angular, more or less appressedly hairy; stipules 8-12 mm. long, lanceolate-subulate. Leaflets subcoriaceous, 2.5-6.3 by 2-2.5 cm. (the terminal the largest), obovate-cuneate, rounded at the apex, glabrous above, paler, closely reticulately veined and with a few appressed hairs beneath; main nerves 6-8 pairs, inconspicuous; petiolules 1.5-2 mm. long; stipels 3-6 mm. long, filiform. Flowers in dense axillary and terminal subsessile racemes 2.5-7.5 cm. long; pedicels 3-4.5 mm. long, filiform, ascending; bracts ovate-cuspidate, 3-4 mm. long, ciliate with white hairs. Calyx 2.5 mm. long, glabrescent; teeth triangular, acute, about as long as the tube. Corolla 5 mm. long, purple. Pods 12-20 by 3-4 mm., ciliate on both edges densely pubescent when young, glabrescent or more or less hairy when ripe, indented and dehiscing along the lower suture; joints 5-8, faintly reticulately veined, as broad as long, the upper edge straight, the lower rounded.

Distribution: Throughout India, Ceylon.—Malaya, E. Africa, China, Japan, Philippines, Polynesia.

The Santals use a preparation of this plant in fainting and convulsions (Campbell).

Santal: Baephol—; *Telugu:* Chepputatta—.

4. **Desmodium triflorum** DC. Prodr. II (1825) 334; Wight Ic. t. 292.—PLATE 310B.

A small perennial trailing herb; stems slender, 15-45 cm. long; branches numerous, prostrate, rooting at the nodes, sparsely hirsute

with white spreading hairs. Leaves 3-foliolate (the lower sometimes 1-foliolate); petioles 5-6 mm. long; stipules ovate, acuminate, 3-4 mm. long, persistent. Leaflets membranous, obovate, cuneate, 5-6 by 4-5 mm. (the terminal slightly larger than the lateral), truncate or emarginate, rarely rounded, glabrous above, more or less hairy beneath; petiolules 1.5-2 mm. long. Flowers 1-5 (usually 3), fascicled in the axils of the leaves; pedicels 6 mm. long, hairy; bracts ovate, acute, ciliate; bracteoles minute. Calyx 3-4 mm. long, clothed with long white hairs; teeth lanceolate, longer than the campanulate tube, ciliate with long white hairs. Corolla 5 mm. long, pink or occasionally white; standard 2.5 mm. broad, broadly obovate, cuneate, produced into a long slender claw. Pods 10-15 by 3-4 mm., the upper edge straight, the lower indented; joints 3-5, as broad as long, reticulately veined, more or less puberulous, the upper edge straight, the lower rounded.

Distribution: Common throughout India, Cosmopolitan in the tropics.

The fresh leaves are applied to wounds and abscesses that do not heal well (Wight). They are used internally as a galactagogue.

A paste of the bruised leaves with kamala is applied to indolent sores and itch. In the mofussil, the fresh juice of the plant is given to children for coughs.

In Ceylon, it is used in dysentery.

In the Gold Coast it is recommended both as a laxative and as a cure for dysentery.

Bengal: Kodalia, Kudaliya—; *Bombay:* Janglimethi, Ranmethi—; *Gujerati:* Jhinopanddhio—; *Hindi:* Kudaliya—; *La Reunion:* Trefle noir—; *Marathi:* Ranmeti—; *Mundari:* Jajalad bihir, Jajalad tasad—; *North-Western Provinces:* Kudaliya—; *Porebunder:* Jhinkopanddhio—; *Sinhalese:* Hinundupiyali—; *Tagalog:* Pacpaclangao—; *Telugu:* Muntamandu, Munuddamoddu—;

5. **Desmodium lasiocarpum** DC. Prod. II, 328.—*D. latifolium* l. c. 327; Wight Ic. t. 270.

A small shrub, 0.9-1.5 m., branches densely velvety-pubescent. Leaves 1-foliolate, petiole short, about 13 mm., stipules broad, suddenly acuminate, leaflet 6.3-7.5 cm., deltoid-ovate, truncate or subcordate at base, obtuse or subacute, repand at margin, finely hairy

above, densely velvety beneath. Flowers small, numerous, on pedicels shorter than calyx, rather crowded on the branches of copious axillary and terminal ascending panicles. Calyx hairy, segments linear-lanceolate. Pod about 2 cm., straight, slightly indented on dorsal, much more so on ventral margin, joints 4-6, as long as broad, hairy.

Distribution: Throughout the tropics of the Old World.

In the Gold Coast native doctors mix the roots with small hot peppers and use them in an enema to cure blood in the urine.

Burma: Kinbun—; *Ewe:* Ledaledair—; *Hausa:* Dankadafi, Hankadafi, Madadafi—; *Santali:* Simmathasura—; *Tamil:* Angu-chabadi, Chinanduri, Chimbadai, Chimbattai, Chirubulladi, Chivamadu, Kidameri, Kubayam, Kuchattinbadi—; *Telugu:* Adiviyantinta, Gaba, Magalinga, Tellanelapariki—; *Twi:* Orto-kotaka—; *Uriya:* Ronodalo—.

6. **Desmodium retroflexum** DC. Prodr. II, 336.

Branches terete, woody, clothed with short spreading hairs at first. Leaves usually 1-foliolate, subcoriaceous, thick, green, glabrous above, densely coated with adpressed white silky hairs beneath, 2.5-5 cm. long and broad; leaflet rotundate-cordate; side leaflets when present much smaller than the end one, petiole 1.3-2.5 cm., deflexed at tip. Racemes copious, simple, axillary and terminal, very dense, subsessile, 2.5 cm. or less long; bracts ovate, ciliated; pedicels 3-4 mm., sharply reflexed. Calyx 2 mm., densely bristly. Corolla twice the calyx. Pod 10-13 mm. long, obscurely hairy, under 3 mm. broad; joints 3-5.

Distribution: Assam, Sylhet, Tenasserim, China.

The root is considered deobstruent, emmenagogue, stomachic, and aperient.

Indo China: Dai phong nui—.

7. **Desmodium pulchellum** Benth. ex Baker in Hook. f. Fl. Brit. Ind. II (1876) 162.—*Dicerma pulchellum* DC.; Wight Ic. 418.

A shrub 1.2-1.5 m. high; branches slender, terete or sometimes slightly angled, grey-downy. Leaves 3-foliolate, 7.5-18 cm. long; petioles 3-16 mm. long, channelled above, densely downy; stipules

5 mm. long, ovate, long-acuminate. Leaflets coriaceous, ovate-elliptic, obtuse or subacute, subglabrous and subrugose above, finely downy, reticulately veined and pale beneath, repand or undulate on the margins, base rounded or subcordate (the terminal 5-12.5 by 2.5-6.3 cm., equilateral, the lateral 2.5-7.5 by 1.6-3.8 cm. oblique); main nerves 8-10 pairs, oblique, prominent beneath; petiolules 1.6-3 mm. long; stipels subulate. Inflorescence axillary or terminal; flowers in racemes 7.5-25 cm. long, composed of solitary, fascicled or umbellate flowers in the axils of 12-40 compound leafy bracts; bracts 2-foliolate, their leaflets orbicular, stipellate, 13 mm. across, glabrous on the upper, finely downy on the lower side, placed back to back on a very short densely villous common petiole which is stipulate at the base. Calyx 2 mm. long, puberulous; teeth lanceolate, shorter than the tube. Corolla 6 mm. long, yellow. Pods 3-6 mm. long, indented on both sutures; joints usually 2 (rarely 1 or 3) slightly longer than broad, reticulately veined, pubescent.

Distribution: All over India, Ceylon.—Malaya.

A decoction of the bark is used in diarrhœa, hæmorrhage, and diseases of the eye.

The flowers are given for biliousness.

Burma: Toungtamin—; *Canarese:* Jenukaddi, Kaduhuralite, Kadumuduru, Tigure—; *Garhwal:* Thapi—; *Hindi:* Jatsalpan—; *Leyte:* Calaicai—; *Malayalam:* Kattumutira—; *Philippines:* Manquit—; *Santali:* Birkapi—; *Sinhalese:* Hampilla—; *Tagalog:* Payang-payang—; *Telugu:* Karrantinta, Kondontinta, Sarivi—; *Uriya:* Jotasalopornni, Kodakotirichunddo, Krishnopornni—; *Visayan:* Calayacay, Caliacay—.

ABRUS Linn.

Climbing shrubs. Leaves pinnate with many pairs of leaflets, the rhachis ending in a bristle; stipules deciduous; stipels minute. Flowers fascicled on axillary racemes or short axillary branches. Calyx-tube small, campanulate, the teeth short. Corolla much exserted; standard clawed, slightly adherent to the staminal tube; keel curved. Stamens 9, in a sheath, the vexillary one absent.

Ovary subsessile, many-ovuled; style incurved, not bearded. Pod oblong or linear, thinly septate between the seeds, dehiscent.—Species 6.—Tropics.

A. precatorius Linn. is used medicinally in China, Indo China, the Philippine Islands, the West Indies, Guiana, Brazil, Senegal, Guinea, Sudan, South Africa, Madagascar, La Reunion.

Its leaves are officinal in Holland.

1. **Abrus precatorius** Linn. Syst. Nat. ed. 12 (1767) 472.—Plate 313A.

A deciduous dextrorse climber, with slender flexible and tough branches, the stem attaining 4.5 m. high and 1.2 cm. diam. Leaves 5-10 cm. long, paripinnate; rhachis produced beyond the last pair of leaflets as a soft bristle. Leaflets 10-20 pairs, opposite, increasing slightly in size from the base, 7.5-23 by 3.8-6 mm., linear or linear-oblong, thinly membranous, entire, rounded at both ends, glabrous above when mature, thinly adpressed-silky beneath. Flowers 1-1.25 cm. long, pink, clustered on tubercles arranged along the rhachis of a one-sided, usually leaf-bearing, axillary, pedunculate raceme 5-10 cm. long. Pod 2.5-4.3 by 1-1.25 cm., turgid, thinly pubescent, with a sharp deflexed beak. Seeds 3-6, ovoid, 7.5 cm. long, scarlet with a black spot at the hilum, polished.

Distribution: Throughout the tropics, often planted.

The root and leaves are sweetish.—The fruit is bitter, acrid; aphrodisiac, tonic, toxic; causes "kapha"; removes biliousness; improves taste and completion; useful in eye diseases; cures leucoderma, itching, skin diseases, wounds.—The root and leaves have the same properties as the fruit, and in addition they cure fevers, stomatitis, head complaints, asthma, thirst, tuberculous glands, caries of the teeth (Ayurveda).

The fruit is acrid with a bad taste; tonic to the brain and the body, aphrodisiac; harmful to old men.—The root and leaves are sweet with flavour; their properties and those of the oil are the same as the properties of the fruit (Yunani).

The root is considered emetic and alexiteric. The watery extract is useful in relieving obstinate coughs. The roots are

employed both in the East and in the West Indies as a substitute for liquorice.

In Ceylon the root is taken for sore throat and rheumatism; the juice of the green leaves is taken for purifying the blood.

In cases of snake-bite the roots are applied to the bitten part (Vaghbata); the leaves are powdered and given internally as an emetic (*Journ. Ayurveda;* 1928).

If the leaves are steeped in warm mustered-oil and applied over the seat of pain in rheumatism much benefit will be derived.

The juice of the fresh leaves, mixed with some bland oil, and applied externally, seems to relieve local pain. In the Konkan they are given to relieve hoarseness.

In Guinea the leaves are used as a substitute for liquorice.

The Zulus use a decoction of the root or leaf as a remedy for pain in the chest.

Internally, the seeds are described as poisonous and useful in affections of the nervous system, and, externally, in skin diseases, ulcers, affections of the hair, etc. The seeds reduced to a paste are recommended to be applied locally in sciatica, stiffness of the shoulder joint, paralysis, and other nervous diseases. In white leprosy, a paste composed of the seed and plumbago root is applied as a stimulant dressing. In alopecia a paste of the seed is recommended to be rubbed on the bare scalp.

The seeds are used as a purgative, but in large doses are an acrid poison, given rise to symptoms resembling those of cholera. Taken internally by women, the seed disturbs the uterine functions and prevents conception.

The powdered seeds are taken as snuff in cases of violent headache arising from cold. Reduced to a paste they are used for contusions and inflammations. Deprived of their outer coating and powdered with sugar-candy they are swallowed to expel intestinal worms.

The seeds are often used criminally for killing cattle. They are powdered and formed into a paste, with which the darts or arrows are dressed. Boiling renders the seed harmless.

The seeds are used as a poison in Java and German East Africa.

In Brazil they have been for centuries a popular cure for granular lids and panus.

In Cambodia the roots are used in the treatment of diarrhœa and the bark is prescribed in dysentery; the leaves and the seeds are given in ophthalmia; the seeds are considered a cure for paludism.

The root applied externally, and the leaves given internally are useless in the treatment of snake-bite (Mhaskar and Caius).

The seeds yield an albumotoxin, abrin, introduced into ophthalmic practice.

Two definite products, abrine and abralin, have now been isolated (N. Ghatak and R. Kauli; *Journ. Ind. Chem. Soc.*, August, 1932).

Afrikaans: Mienie-mienies—; *Annam:* Cam thao hot do, Chu chi—; *Arabic:* Aainuddik—; *Assam:* Latuwani—; *Bengal:* Chunhati, Gunch, Kunch—; *Betsileo:* Vahemboamena—; *Bombay:* Ghungchi, Gunja—; *Burma:* Gyingwe, Ywegne, Ywegune—; *Cambodia:* Angkrang—; *Canarese:* Galaganji, Gunja, Gunji, Guruganji, Haga, Jeshtamadhu, Madhuka, Madhukavalli—; *Cebu:* Agayon, Laga—; *Chinese:* Hong Siang Se, Hsiang Szu Tzu, Siang Se Tse—; *Cutch:* Rati—; *Deccan:* Gumchi—; *Dun:* Chuntli, Ratti—; *Dutch East Indies:* Saga—; *English:* Indian Liquorice, Jeriquity, Paternoster Pea, Rosary Pea, Weather Plant, Wild Liquorice—; *French:* Abre, Abre ă chapelets, Arbre à chapelets, Cascavelle, Herbe à beau-père, Herbe de réglisse, Jequirity, Jeriquity, Liane de bedeau, Liane ă réglisse, Liane ā réglisse d'Amérique, Pois d'angole, Pois de bedeau, Réglisse d'Amérique, Réglisse des Antilles, Réglisse des îles, Réglisse indienne, Réglisse sauvage, Réglisse sauvage de la Jamaique, Réglissier—; *French Guiana:* Petit panacoco—; *Gujerati:* Chanoti, Gunja—; *Hasada:* Arakaead, Kaead—; *Hausa:* Idon zakara—; *Hindi:* Chirmiti, Gaungchi, Ghunghachi, Gunchi, Gunja, Kunch, Rati—; *Hova:* Masonamboatora, Voamaintilany, Voamatorona—; *Ilocano:* Bugayon—; *Indo China:* Ang krang, Ang kreng, Day cam thao, Day chi chi, Day cuom cuom, Nhuong nhan tu, Tuong tu tu—; *Java:* Zagazaga—; *Kano:* Taga rana, Tandara—;

Katsina: Tandara—; *Konkani:* Gunji, Madalavela—; *Kumaon:* Ratti—; *La Reunion:* Cascavelle, Reglisse marronne, Soldat—; *Lepcha:* Suhusiligrim—; *Madagascar:* Voamaintorona—; *Malay:* Akar belimbing, Akar saga betina—; *Malayalam:* Atimadhuram, Irattimadhuram, Kakani, Klitakkam, Kunni, Kunnikkuru, Madhukam, Madhumulam, Shekkunni—; *Marathi:* Chanoti, Gunchi, Gunja, Kunch—; *Naguri:* Arakaed, Kaed—; *Nepal:* Lalgeri, Maspati—; *Pampangan:* Cansasaga—; *Persian:* Chashmekharush, Chashmkuros—; *Punjab:* Labri, Ratak—; *Sakalave:* Voamboanamainty, Voamboanamavo, Voamboanamara—; *Sanskrit:* Angaravallari, Aruna, Bhilabhushana, Chakrashalya, Chataki, Chudala, Chudamani, Dhvankshanakha, Durmogha, Gunja, Gunjika, Kaka, Kakachinchi, Kakachinchika, Kakadani, Kakajangha, Kakanantika, Kakashimbi, Kakatikta, Kakatundika, Kakavallari, Kakini, Kaksha, Kamboji, Kanchi, Kanichi, Krishnachudika, Krishnala, Mirintika, Rakta, Raktala, Raktika, Saumya, Shangushtha, Shikhandi, Shikhandini, Shitapaki, Shvetabija, Shvetagunja, Shvetkamboji, Shvetaraktika, Shvetochchata, Shyamalachuda, Tamrika, Tulabija, Uchchatta, Vaktrashalya, Vanya, Vayasadini—; *Santal:* Kawet—; *Sinhalese:* Olindawel—; *South Africa:* Jequirity, Love Bean, Lucky Bean, Prayer Beads—; *Swahili:* Muturituri—; *Tagalog:* Bangati, Saga, Sagamamin, Sagasaga—; *Tamil:* Adisamiyai, Adimaduram, Adingam, Atti, Edalagam, Egunru, Kandam, Kunjam, Kunjuram, Kunri, Kunrimani, Kuruvindam, Maduragam, Singili, Siridam, Sittilai—; *Telugu:* Atimadhuramu, Gurija, Gurivenda, Guruginja, Kukkutamu, Raktika, Sinnaguruginja—; *Urdu:* Ghunchi—; *Uriya:* Gunja, Kainsho, Kotibopolo, Mondakainsho, Roti, Ryunjo—; *Visayan:* Agiyangiyang, Agniyangyiang, Aguyangyang, Arogangyang, Bangati, Caloo, Gicosgicos, Guicosgicos, Mangadolong, Matangpune, Oyangia—; *Zulu:* umKhokha—.

CICER Linn.

Annual herbs. Leaves pinnate, rigid; leaflets and stipules strongly veined, deeply toothed. Flowers solitary in the axils of the leaves. Calyx-tube oblique; teeth lanceolate, subequal. Corolla

exserted; standard broad, exceeding the wings and keel, wings free from the keel. Stamens 2-adelphous, anthers uniform. Ovary sessile, 2- or many- ovuled; style incurved, beardless, stigma capitate. Pod sessile, oblong, turgid, narrowed into the persistent style.—Species 15.—W. Asia.

C. arietinum Linn. is used medicinally in Europe.

1. **Cicer arietinum** Linn. Sp. Pl. (1753) 738.—PLATE 313B.

A viscid much-branched annual. Leaves 2.5-5 cm. long, with usually a terminal leaflet; stipules small, obliquely ovate, toothed; leaflets about 6 mm. long, ovate oblong or obovate, deeply cut. Peduncle 1.3-2 cm., jointed about the middle, deflexed after flowering. Calyx 6-8 mm., teeth linear. Corolla scarcely half as long again as the calyx, pink, blue or white. Pod 2-2.5 cm., turgid, pubescent, topped by the persistent base of the style. Seeds obovate or subglobose, beaked, reddish brown, black or white.

Distribution: Largely cultivated in most parts of India.—Native most probably in some parts of S.-E. Europe.

The leaves are sour; astringent to the bowels; improve taste and appetite; cure bronchitis; cause flatulence.—The unripe seed is stimulant, tonic, aphrodisiac; cures thirst and burning.—The seed is sweet, refrigerant, dry; appetiser; tonic, anthelmintic; causes flatulence; useful in leprosy, bronchitis; cures skin diseases, blood troubles, ozoena, throat complaints, biliousness.—The acid exudation is astringent and useful in dyspepsia and constipation (Ayurveda).

The leaves are purgative, abortifacient; tonic to the hair; useful in cold pains; cause flatulence.—The seed is sweet when raw; indigestible, aphrodisiac, anthelmintic, tonic; good for diseases and enlargement of the liver and spleen, for complaints of the chest, throat troubles, foul mouth, and fever; enriches the blood; cures skin diseases, inflammations more especially of the ear (Yunani).

The fresh plant put into hot water is used in the Deccan in the treatment of dysmenorrhoea; the patient is made to sit over the steam.

The acid exudation—" vinegar "—is considered a useful astringent.—In Gujarat it is used as an antidote to snake venom.

In Europe the seeds are used as a diuretic and as an

anthelmintic. In some parts an infusion is given to allay the pain due to urinary calculi.

The acid exudation is useless in the treatment of snake-bite whether given internally or applied externally (Mhaskar and Caius).

The bristles of the chick-pea contain free oxalic acid.

The proteins of Bengal Gram have been isolated and analysed by Nuggihalli Narayana (*Journ. Ind. Inst. Sc.;* 13, 1930).

Arabic: Jumez—; *Bengal:* But, But kalai, Chola—; *Bambay:* Chana, Harbara—; *Burma:* Kalapai—; *Canarese:* Karikadale, Kempukadale, Kudoly—; *Carnatic:* Kadli—; *Catalan:* Sigro, Siuro—; *Deccan:* Chenna—; *Dutch:* Keker—; *Egypt:* Homos—; *English:* Bengal Gram, Chick Pea, Common Gram—; *French:* Café français, Céseron, Cicerolle, Ciserole, Ciseron, Gairoutte, Garbance, Garoutte, Garvance, Garvane, Pesette, Pois bécu, Pois blanc, Pois de brebis, Pois breton, Pois chiche, Pois ciche, Pois cornu, Pois gris, Pois pointu, Tête de bélier—; *German:* Kichererbse—; *Gujarat:* Chana, Chania—; *Hindi:* But, Chana, Chunna—; *Italian:* Cece, Ceci—; *Konkani:* Chono—; *Languedoc:* Becudo, Ceze, Cezerous, Cezes—; *Melta:* Chick-pea, Garavance, Gram, Ceci, Cicri—; *Marathi:* Harbara—; *Mundari:* But, Moroejang—; *Persian:* Nakhud—; *Portuguese:* Ervanco, Grao de bico—; *Punjab:* Channa, Chola—; *Rajputana:* Chana, Chola—; *Roumanian:* Naut, Nohot—; *Russian:* Ovetche harokh—; *Sanskrit:* Balabhaishajya, Balabhojya, Chanaka, Harimantha, Jivana, Kanchuki, Krishnachanchuka, Sakalapriya, Sugandha, Vajibhakshya, Vajimantha—; *Santali:* But—; *Sind:* Chahna, Chano—; *Sinhalese:* Kondakadala—; *Spanish:* Garbanzo—; *Tamil:* Kadalai—; *Telugu:* Harimandhakam, Sanuagalu—; *Urdu:* But, Chana—.

LATHYRUS Linn.

Annual or perennial herbs. Leaves abruptly pinnate, the rhachis ending in a tendril or bristle; stipules foliaceous. Flowers solitary or racemose; bracts caducous, usually minute; bracteoles 0. Calyx-tube usually oblique at the base; teeth subequal or the upper shorter. Corolla more or less exserted; standard broadly ovate or orbicular, emarginate, narrowed into a short claw; keel shorter than

the wings, incurved, obtuse. Stamens diadelphous, the mouth of the staminal tube not oblique; anthers uniform. Ovary subsessile or stalked, ovules many; style inflexed, bearded on the inner (by the twisting of the style often the outer) face, otherwise glabrous; stigma capitate. Pod compressed or subterete, 2-valved, continuous within, many-seeded.—Species 110.—N. temperate zone and mts. of tropical Africa and S. America.

1. Leaflets abortive .... 2. *L. aphaca.*
2. Leaflets 3-13 mm. broad .... 1. *L. sativus.*
3. Leaflets 2, lanceolate .... 3. *L. pratensis.*

The seeds are astringent and resolvent.

L. aphaca Linn., *L. ochrus* DC., *L. pratensis* Linn., *L. sativus* Linn., *L. sylvestris* Linn. are used medicinally in Europe.

Prussic acid has been found in several species.

1. **Lathyrus sativus** Linn Sp. Pl. (1753) 730.—PLATE 314A.

A glabrous much-branched annual with winged stems. Leaves ending in 3-fid tendrils; stipules broad, entire, acuminate, semi-sagittate; petiole about 2.5 cm., winged; leaflets 2, linear-lanceolate, acuminate, entire. Peduncles longer than the petioles, 1-flowered. Calyx-teeth spreading in flower, lanceolate, about twice as long as the tube. Corolla 2 cm., reddish purple or blue, rarely white; standard rather broader than long, emarginate. Pod 3.8 cm. long, with a conspicuous wing on either side of the dorsal suture. Seeds 4-5, compressed, brown or yellowish, marbled with red.

Distribution: Cultivated in many parts of India.—Probably indigenous in the region extending from the south of the Caucasus to the north of India.

The leaves remove biliousness and "kapha", but cause flatulence.—The seed is sweet, bitter, acrid, very dry; astringent to the bowels, cooling, tonic; improves taste; removes "kapha" and biliousness; causes much flatulence, lameness, heart troubles, pain, inflammation, burning, piles, and wandering of the mind (Ayurveda).

The oil from the seeds is a powerful, but dangerous, cathartic.

"I conclude, therefore, that the experimental proof of the factor in a lathyrus crop which causes lathyrism is not yet complete, and I urge that further research may be devoted to the solution of this

important problem" (H. Stott; *Ind. Journ. Med. Research*, July, 1930).

Bengal: Kassur, Khesari, Teora—; *Catalan:* Cairetas, Guixas—; *English:* Chickling Vetch, White Vetch—; *French:* Dent de brebis, Gesse cultivée, Gesse domestique, Jarosse, Jarrat, Lentille d'Espagne, Lentille suisse, Lentillin, Pesette, Pois de brebis, Pois breton, Pois carré, Pois gesse, Pois gros, Pois ă odeur, Pois de senteur—; *German:* Kicherling, Platterbse, Saatplatterboe—; *Gujerati:* Lang, Langue—; *Hindi:* Kasari, Kassar, Kassur, Khesari, Latri, Tiuri—; *Languedoc:* Begos, Tseisso—; *Malta:* Chickling Vetch, Cicciarda, Favetta—; *Marathi:* Lakh—; *Mundari:* Kansari, Kesari—; *Nepal:* Kesari—; *North-Western Provinces:* Chapa, Chural, Kasa, Kisara, Latri, Mattar, Tiura—; *Persian:* Masang—; *Portuguese:* Chicharo, Ervilhaca—; *Punjab:* Chural, Karas, Karil, Kisari, Mattar—; *Roumanian:* Mazariche—; *Russian:* Lugovoi goroshek, Tchina—; *Sanskrit:* Lanka, Sandika, Triputa—; *Santali:* Kesari—; *Sind:* Mattar—; *Spanish:* Almortas, Guijas, Muelas, Pinsoles, Pitos, Titos—.

2. **Lathyrus aphaca** Linn. Sp. Pl. (1753) 729.

Annual, glabrous; stems trailing, about 30 cm. Rhachis ending in a tendril. Leaflets none. Stipules leaf-like, cordate, triangular, about 2.5 by 1.3 cm., entire. Flowers yellow, 8 mm. long, solitary, rarely two, at the end of long, axillary stalks. Pod 2.5-3.2 cm.; seeds 4-6.

Distribution: Throughout N. India ascending to 7,000 ft.—W. Asia, N. Africa, Europe.

The ripe seeds are said to be narcotic. The flower is resolvent.

Bengal: Janglimatar, Musurchuna—; *English:* Yellow-flowered Pea, Yellow Vetchling—; *French:* Aphaca, Chique, Gesse aphaca, Pois aux lièvres, Reluiseau—; *Hindi:* Janglimatar—; *Languedoc:* Carnabiou, Cornobioou—; *Malta:* Yellow Vetchling, Mullaghera, Fior galletto, Vetriolo, Porvlina—; *Nepal:* Kaibu—; *Punjab:* Rawan, Rawari—.

3. **Lathyrus pratensis** Linn. Sp. Pl. (1753) 733.

Annual, hairy; stems trailing, 30-90 cm. Rhachis ending in a tendril. Leaflets 2, lanceolate, 2.5-5 cm. Stipules large, leaf-like,

base 2-lobed. Flowers yellow, 8-13 mm. long, in long, stalked racemes. Staminal tube nearly abruptly truncate. Pod glabrous, 3.8 cm.; seeds numerous.

Distribution: W. Himalaya, 6,000—8.000 ft.—W. Asia, N. Africa, Europe.

The seeds are used in Spain as a resolvent.

English: Angleberries, Crawpea, Fitch, Lady's Fingers, Meadow Vetchling, Mouse Pea, Tom Thumb Vetchling, Yellow Fitchling, Yellow Tar—.

Pisum Linn.

This genus is principally distinguished from Lathyrus by its thick laterally compressed style.—Species about 6.—Mediterranean region and W. Asia.

P. sativum Linn. is used medicinally in Europe and China.

1. **Pisum sativum** Linn. Sp. Pl. (1753) 927.

An annual plant, 1-2 cm. high. Stipules as long as 1-2-flowered peduncles; leaflets entire, 3-4 cm. long, 2-3 cm. broad. Flowers white or pink. Seeds globular, smooth, 6-8 mm. diam.

Distribution: Generally cultivated.

The seed is sweet, slightly acrid; cooling, fattening; laxative; purifies the blood; improves the appetite; causes flatulence; useful in bronchitis, biliousness, and burning sensation (Ayurveda).

Peas are believed to cause dysentery when eaten raw.

In Spain the flour from the seeds is considered emollient and resolvent, and it is applied in the form of cataplasm.

In Germany peas are thought good for many complaints, especially for wounds and bruises; also children affected with measles are washed there systematically with water in which peas have been boiled.

Arsenic has been found in the ash of the seeds.

Arabic: Hummus—; *Bengal:* Burramatar, Kuda, Matar—; *Bombay:* Vatana, Watana—; *Burma:* Pai—; *Canarese:* Batgadle—; *Catalan:* Pesol, Pesol caputchi, Tirabech—; *Central Provinces:* Butana—; *Chinese:* Wan Tou—; *Deccan:* Watana—; *Dutch:* Erwt—; *English:* Garden Pea, Pea, Peas, Pease, Peason—; *French:*

Pois, Pois cultivé, Pois gourmand—; *German:* Erbse—; *Gujerati:* Patana, Vatana—; *Hindi:* Bahtahna, Baramattar, Battanichola, Buttani, Golmattar, Kerava, Matar, Wattahna,—; *Hova:* Petipoa, Pitipoa— *Konkani:* Vatane chana—; *Ladak:* Ahandil, Shanma—; *Malay:* Kachang—; *Malayalam:* Pattani—; *Malta:* Pea, Pisello, Piselli—; *Marathi:* Vatane, Watana—; *North-Western Provinces:* Batana, Golmattar, Kalon, Kulai, Mattar—; *Oudh:* Ahsa, Matra—; *Portuguese:* Ervilha—; *Punjab:* Baramattar, Khanda, Mattar, Sen—; *Roumanian:* Mazere—; *Russian:* Garoshina—; *Sanskrit:* Ativartula, Harenu, Kalaya, Kanti, Khindaka, Mundachandaka, Nilaka, Renuka, Satila, Satilaka, Satinaka, Shaman, Triputa—; *Sind:* Larkana—; *Sinhalese:* Ratagoradiya—; *Spanish:* Guisante, Guisante azucarado, Guisante pequeno, Guisante mollar, Tirabeque—; *Tamil:* Pattani, Vellappattani—; *Telugu:* Gundusanighelu, Patanlu—.

GLYCINE Linn.

Twining or prostrate herbs, rarely suberect. Leaves pinnately 3-7-foliolate; stipules small. Leaflets stipellate. Flowers small, in axillary racemes, solitary or fascicled along the rhachis; bracts and bracteoles small. Calyx-tube campanulate; teeth distinct, long or short. Corolla usually but little exserted; standard subauricled at the base; wings narrow, adhering to the keel; keel shorter than the wings, obtuse. Stamens monadelphous, or the vexillary stamen at length free; anthers uniform. Ovary subsessile; ovules many; style slightly incurved, usually short, beardless; stigma capitate. Pod linear or linear-oblong, 2-valved. Seeds few.—Species 16.—Paleotropics.

G. soja Sieb. & Zucc. is used medicinally in China and Indo China, *G. hispida* Maxim. in the Malay Peninsula.

The oil from *G. soja* is officinal in Sweden.

1. **Glycine soja** Sieb. & Zucc. in Journ. Linn. Soc. VIII, 266; Bakar in Hook. f. Fl. Brit. Ind. II, 184 (non Sieb. & Zucc.).—*Dolichos Soja* Linn.; Roxb. Fl. Ind. III (1832) 314.—PLATE 314B.

An annual, with stout suberect or climbing stems, densely clothed with fine rusty coloured hairs. Leaves 3-foliolate, long petioled;

leaflets 5-10 cm. long, ovate, usually acute. Racemes sessile, few-flowered. Calyx 6 mm., densely hairy; teeth long, setaceous. Corolla reddish purple; not much exserted. Pods 2-3 in the axils of the leaves, 3.8-5 cm. long, linear-oblong, recurved, densely pubescent, subtorulose, 3-4-seeded.

Distribution: Lower slopes of the Himalaya up to 6,000 ft. from the Punjab eastwards, Bengal, Khasia, Manipur, Naga Hills, Burma.—Considered to be a native of Cochin-China, Japan, and Java.

A decoction of the bark is said to possess astringent properties.

Bengal: Garikulay—; *Chinese:* Huang Ta Tou, Pai Tou, Ta Tou—; *Eastern Terai:* Khajuwa—; *English:* Soy Bean—; *Hindi:* Bhat, Bhatwan, Ramkurthi—; *Indo China:* Dau nanh, Dau tuong, Hoang dau mieu, Thua hon—; *Kumaon:* Bhut—; *Malay:* Kachang bulu rimau—; *Naga:* Tzu-dza—; *Nepal:* Bhatnas, Bhatwas—; *Newari:* Gya, Musa—; *Punjab:* Bhut—; *Parbatiya:* Kala botmas, Seta—; *Santali:* Horec—; *Terai:* Khajuwa—.

TERAMNUS Sw.

Twining slender herbs. Leaves pinnately 3-foliolate; stipules small. Leaflets stipellate. Flowers very small, in few-flowered fascicles in the axils of the leaves, or in axillary racemes, the flowers twin or fascicled along the rhachis; bracts and bracteoles small. Calyx-tube campanulate; the 2 upper teeth connate or distinct. Corolla little exserted; standard obovate, narrowed at the base, not spurred; wings narrow, adhering to the keel; keel shorter than the wings, almost straight, obtuse. Stamens monadelphous; alternate anthers very small, abortive. Ovary sessile; ovules many; style short, thick, beardless; stigma capitate. Pod linear, 2-valved, septate within between the seeds, hooked with the persistent style at the tip.—Species 6.—Tropics.

T. labialis Spreng. is used medicinally in La Reunion.

1. **Teramnus labialis** Spreng. Syst. 3 (1826) 235.—*Glycine labialis* Linn. f. Suppl. 325; Wight Ic. t. 168.—PLATE 315.

A widely spreading twining herb; stems slender, more or less appressedly hairy. Leaves 3-foliolate; petioles 1.2-3.8 cm.; stipules 3 mm. long, ovate-lanceolate, acute, deciduous. Leaflets membranous

or subcoriaceous, 3.8-6.3 by 2-2.5 cm. (the terminal slightly the largest), ovate-oblong or oblong-lanceolate, subacute, apiculate, glabrous above, slightly appressedly hairy beneath, base rounded or acute; stipels subulate, 1.5-2.5 mm. long. Flowers in axillary few-flowered lax racemes 5-15 cm. long, solitary or fascicled along a slender more or less hairy rhachis; pedicels 4 mm. long; bracts 2 mm. long, linear-lanceolate; bracteoles 1.5 mm. long, subulate. Calyx 3-4 mm. long, silky; teeth lanceolate, as long as the campanulate tube. Corolla 4.5-6 mm. long, reddish. Pods 3.8-5 cm. by 2.5 mm., narrowly linear, straight or slightly incurved, hairy when young, nearly glabrous when mature, with a short stout beak bent upwards so as to form nearly a right angle with the pod. Seeds 8-12, oblong, truncate or slightly rounded at the ends, smooth, dark brown.

Distribution: Throughout India, Ceylon, and the tropics generally, Natal.

The fruit is bitter, cooling, sweet, dry; aphrodisiac, astringent to the bowels, antipyretic, tonic, galactagogue; causes "kapha"; cures "vata", inflammation, biliousness, blood diseases, gout, "tridosha" fevers, consumption, bronchitis, thirst, burning sensation; useful in paralysis, rheumatism, and affections of the nervous system (Ayurveda).

Slightly astringent. In La Reunion it is considered very useful in hæmoptysis and catarrhs.

Antsianaka: Famihifory—; *Bengal:* Mashani—; *Gujerati:* Valiyovelo—; *Hindi:* Mashoni—; *La Reunion:* Pistache marronne—; *Sakalave:* Takotsifotra—; *Sanskrit:* Ardramasha, Ashvapuchhi, Atmodbhava, Bahuphala, Ghana, Hansamasha, Hayapuchhi, Hayapuchhika, Kalyani, Kamboji, Krishnavanta, Krishnavrinta, Mahasaha, Mangalya, Mansamasha, Mashaparni, Mashaparnika, Panduloma, Pandulomasha, Pandulomashaparnini, Pandura, Parnini, Shaliparni, Sinhamukhi, Sinhapuchhi, Sinhapuchhika, Sinhavinna, Sulabha, Suryaparni, Svayambhu, Trashiprokta, Vajramuli, Vishambika—.

MUCUNA Adams.

Twining shrubs or herbs. Leaves pinnately 3-foliolate; stipules deciduous; stipels minute. Flowers large, purple or greenish, mostly

fascicled on the tumid modes of racemes which are axillary or lateral on the old branches or stems. Calyx-tube widely campanulate, the lowest tooth long, the lateral short, the upper 2 connate. Corolla much exserted; standard about half the length of the wings and keel, auricled at the base; keel incurved. Stamens diadelphous; anthers dimorphous, the longer basifixed, the shorter ovate or bearded. Ovary sessile, villous, 2-many-ovuled. Pod usually covered with fine irritating pungent bristles.—Species 35.—Tropics and subtropics.

1. Pod with the faces covered with close oblique plates but not winged down the sutures .... 1. *M. monosperma.*
2. Pod broadly winged down both sutures but not plated on the faces .... 2. *M. gigantea.*
3. Pod without either distinct plates on the faces or wings down the sutures .... 3. *M. prurita.*

Tonic, diuretic, laxative, anthelmintic.

The following species are used medicinally in China—*M. capitata* W. & A.—; in Indo China—*M. prurita* Hook.—; in the Philippine Islands—*M. monosperma* DC., *M. prurita* Hook.—; in the West Indies—*M. prurita* Hook., *M. urens* DC.—; in Guiana—*M. prurita* Hook.—; in South America—*M. urens* DC.—; in Madagascar—*M. horrida* Baillon, *M. prurita* Hook.—; in South Africa—*M. coriacea* Baker, *M. irritans* Burtt-Davy—.

1. **Mucuna monosperma** DC. Prodr. II (1825) 406.—PLATE 316.

A large woody perennial twiner; young branches clothed with rusty brown deciduous tomentum. Leaves 15-23 cm. long; petioles 7.5-11.5 cm. long; stipules 4 mm. long, linear, deciduous. Leaflets 7-10 by 5-7.5 cm., thinly coriaceous, ovate-oblong or elliptic, shortly acuminate (the lateral leaflets inequilateral, the lower side the largest), glabrous above, more or less pubescent beneath, base rounded. Flowers in 6-12-flowered corymbose axillary racemes shorter than the leaves; peduncles variable in length, 1.2-6.3 cm. long; pedicels 6-12 mm. long; bracts small, triangular, 4 mm. long, deciduous; bracteoles 1.5 cm. long, linear-lanceolate. Calyx 1 cm. long, clothed with irritant bristles; teeth about half as long as the tube, the upper truncate, the lateral deltoid, the lower linear. Corolla 3.8 cm. long, purple; keel abruptly inflexed at the tip. Pods 5-7.5 by 5.7 cm.

(nearly as broad as long) winged on both sutures and obliquely plaited on the faces, covered with brown deciduous irritant bristles. Seed solitary, nearly circular in horizontal cross section, slightly compressed, dark brown, smooth, shining; hilum linear, extending round three-fourths of the edge.

Distribution: E. Himalaya, Khasia, Assam, Chittagong, Konkan, S. M. Country, Ceylon.

The seed is bitter, sweet; refrigerant, tonic, cardiotonic, astringent to the bowels, aphrodisiac; cures "tridosha"; useful in biliousness and "vata" (Ayurveda).

The seed is used as an expectorant in cough and asthma, and is applied externally as a sedative (Peters).

Bombay: Mothikuhili, Sonagaravi—; *Canarese:* Anipeballi—; *English:* Negro Bean—; *Gujerati:* Adadaveliya, Kagadoliya—; *Marathi:* Godikohali—; *Nepal:* Baldhengra—; *Sanskrit:* Dadhipushpi, Kakakolapalika, Khatava, Khatavangi, Khatvapadi, Kupa, Paryankapadika, Vanshya—; *Tagalog:* Buiguiguit, Lipai—; *Tamil:* Periyattalargai—; *Telugu:* Enugadulagondi, Guttapugacha, Peddadulagondi—.

2. **Mucuna gigantea** DC. Prodr. II (1825) 405.—PLATE 317A.

A large woody perennial twiner; stems reaching a great length; branches slender, glabrous. Leaves 12.5-23 cm. long; petioles 10-12.5 cm. long, glabrous; stipules linear, 5 mm. long. Leaflets 10-12.5 by 5-6.3 cm., ovate or elliptic, acuminate (terminal leaflets equal-sided and cuneate, lateral leaflets inequilateral and rounded at the base), glabrous on both surfaces; stipels 3 mm. long, subulate. Flowers in umbelliform corymbs; peduncles 10-45 cm. long; pedicels 2 cm. long; bracts and bracteoles minute, deciduous. Calyx 1-1.3 cm. long, with a few irritant bristles; tube cylindric; upper lip subtruncate, the 3 lower teeth very small and triangular in bud, afterwards obsolete. Corolla 2.5-3.8 cm. long, greenish yellow; keel not abruptly inflexed at the tip. Pods 7.5-15 by 5 cm., broadly winged down both sutures, but not plaited across the face, clothed with deciduous yellowish brown irritant bristles. Seeds 2-6; hilum extending round more than half the edge.

Distribution: A littoral species found on the Indian and Malayan coasts.

The bark is used in rheumatic complaints. It is pulverized, mixed with dry ginger, and rubbed over the parts affected (Rheede).

The bristles of the pods are used as a poison in the Malay Peninsula.

Canarese: Turibilangi—; *English:* Elephant Cowitch—; *French:* Gros pois ă gratter, Gros pois pouilleux—; *Malayalam:* Kakavalli—; *Tamil:* Kalgaivalli—; *Telugu:* Enugadulagondi—.

3. **Mucuna prurita** Hook. Bot. Misc. II, 348, t. XIII.—*M. pruriens* Bak. in Hook. f. Fl. Brit. Ind. II, 187 (non DC.).—Plate 317B (under *M. pruriens*).

An annual twiner; branches slender, more or less hairy at first, at length glabrescent. Leaves 3-foliolate; petioles 6.3-11.3 cm. long, appressedly silky; stipules lanceolate, 5 mm. long. Leaflets membranous, 7.5-12.5 by 5-7.5 cm. (the terminal leaflets slightly the smaller, rhomboid-ovate with cuneate base, the lateral leaflets with truncate base, very inequilateral, the lower side greatly dilated), all subacute, mucronate, pubescent above, densely clothed with silvery-grey hairs beneath. Flowers in elongate 6-30-flowered racemes 15-30 cm. long, the flowers solitary or 2-3 together along a slender silky rhachis; pedicels 3-6 mm. long, hairy; bracts 1.2 cm. long, lanceolate, hairy, caducous; bracteoles 8 mm. long, hairy, caducous. Calyx 1 cm. long, silky and with a few irritant bristles outside; tube campanulate; upper teeth completely connate into a triangular lip equalling the tube, lateral teeth lanceolate as long as the tube, the lower tooth lanceolate and slightly longer. Corolla 2.5-3.7 cm. long, purple; keel slightly incurved. Pods 5-7.5 by 1.2 cm., turgid, with a longitudinal rib running the length of each valve, not winged on the margins nor transversely plaited on the faces, falcately curved on both ends, somewhat like the letter S, densely clothed with persistent irritant bristles which are at first pale brown, afterwards steel-grey. Seeds 5-6, small; hilum not half the length of the circumference of the seed.

Distribution: Punjab Plain, from the base of the Himalaya to Ceylon and Burma.—Cosmopolitan in the tropics and often cultivated.

The root is given in dysentery and in uterine troubles.—The fruit is sweet, bitter; aphrodisiac, tonic; cures blood diseases, " vata ", consumption, biliousness, indolent ulcers.—The seeds are aphrodisiac; cure " vata " (Ayurveda).

The root acts as an emmenagogue; its smoke accelerates delivery and lessens the pain.—The leaves are aphrodisiac, tonic, anthelmintic; lessen inflammations; improve the blood; juice given for headache.—The seeds are alexipharmic and cure scorpion-sting; laxative, aphrodisiac, tonic; useful in gonorrhœa (Yunani).

Ainslie says that a strong infusion of the root, mixed with honey, is prescribed by the Tamool doctors in cholera.

The root is prescribed as a remedy for delirium in fever in Chota-Nagpur. Powdered and made into a paste, it is applied to the body in dropsy, a piece of the root being also tied to the wrist and ankle. The seed is believed to absorb scorpion-poison when applied to the part stung (Campbell).

In French Guiana the root is used as a purgative.

In the West Indies, a decoction of the root is reckoned a powerful diuretic and cleanser of the kidneys, and also made into an ointment for elephantiasis. Leaves are applied to ulcers. A vinous infusion of the pods is said to be a certain remedy for dropsy.

The pods are used as an anthelmintic.

The use of the hairs of the mucuna pod as a vermifuge to expel ascarids appears to have originated in the West Indies. They are made into a bolus with fat and swallowed. This is to be followed by a purge.

An ointment prepared with the hairs acts externally as a local stimulant and mild vesicant.

The fruit in combination with other drugs is recommended for the treatment of snake-bite (Rasaratnakara); the seeds are prescribed for scorpion-sting (Sushruta).

The fruit is not an antidote to snake-venom (Mhaskar and Caius). The seeds are useless for the treatment of scorpion-sting (Caius and Mhaskar).

Arabic: Habulkulai—; *Ashanti:* Apenga—; *Bengal:* Akolshi,

Alkusa, Bichchoti, Kamach—; *Betsileo:* Agy—; *Bombay:* Kuhili—; *Burma:* Khuele, Khwele—; *Canarese:* Hasaguni, Kadavare, Markate, Nasukunni, Nayisonguballi, Turashi—; *Deccan:* Kachkuri, Kanchkuri—; *Dehra Dun:* Gaunch, Kaunch—; *English:* Cowage, Cowhage, Cowitch—; *French:* Pois ă démanger, Pois ă gratter, Petit pois à gratter, Pois pouilleux, Petit pois pouilleux, Pois velus—; *Ga:* Angengngleng—; *German:* Kratzbohnen, Kuhkraetze—; *Gold Coast:* Cow Itch—; *Guiana (French):* Pois ă gratter—; *Gujerati:* Kancha, Kanchan, Kavatch, Kivanch—; *Hausa:* Karara—; *Hindi:* Goncha, Kawanch, Kivachh, Kivanchh, Konch—; *Indo China:* Dau meo rung—; *Kolami:* Alkusi—; *Krobo:* Tshakatshaka—; *La Reunion:* Pois ă gratter—; *Lepcha:* Kajukoprik—; *Malay:* Kachang babi, Kachang Karkaras gatal—; *Malayalam:* Naykkuruna, Shorivalli, Shoriyanam—; *Marathi:* Kavacha, Kuhili, Kuyeli—; *Mexico:* Ojo de venado—; *Monghyr:* Karyani—; *Mundari:* Itika, Itka—; *Nepal:* Kaochir, Kouatch—; *North-Western Provinces:* Goncha—; *Nzima:* Atinga—; *Persian:* Anareghorash—; *Porebunder:* Bherwa, Kauchan—; *Punjab:* Gunchgaji, Kanaucha, Kawanch, Konchkari, Kunch—; *Sakalave:* Taingilotra, Tainkilotra, Tangilotra—; *Sanskrit:* Adhyanda, Ajada, Ajavha, Arshabhi, Atmagupta, Badari, Chanda, Durabhigraha, Dusparsha, Gatrabhanga, Guru, Jada, Kachhumati, Kachhura, Kandura, Kapikachhu, Kapiprabha, Kapiromaphala, Kashiroma, Kundali, Maharshabhilangali, Markati, Pravrisha, Pravrishayani, Rishabhajata, Rishabhi, Rishyaprokta, Romalu, Romavalli, Sadyashotha, Shimbhi, Shukapindi, Shukashimba, Shukashimbika, Shukavati, Sugupta, Svagupta, Svayamgupta, Tikshna, Vanari, Vanashukari, Varahika, Vrishya, Vyaghra, Vyanga—; *Santali:* Etka—; *Sinhalese:* Achariyapalle—; *Spanish:* Picapica menor, Guisante piojoso menor—; *Tagalog:* Lipai—; *Tamil:* Amudari, Arugrattam, Attumabuttar, Irishiya, Kadigandu, Kavi, Maguttam, Punaikkali, Punaippidukkan, Punaiyavarai, Sugasimbi—; *Telugu:* Dulagondi, Duradagondi, Pilliyadagu, Pravrishayani, Telladuradagondi, Totadulagondi—; *Tulu:* Nayisonguballi—; *Twi:* Apenga—; *Urdu:* Kavancha—; *Uriya:* Alokushi, Baidhonko, Kachu, Morkotomado—; *Visayan:* Lipay, Nipay—.

ERYTHRINA Linn.

Trees; branches usually prickly. Leaves pinnately 3-foliolate; stipules small. Leaflets furnished with glanduliform stipels. Flowers in axillary and terminal racemes, handsome, usually bright red, twin or fascicled along the rhachis; bracts and bracteoles small or 0. Calyx with an oblique mouth, splitting down to the base, or campanulately bilabiate. Petals unequal; standard much exserted, considerably exceeding the keel and wings. Vexillary stamen free nearly to the base or connate with the others half-way up the filaments; anthers uniform. Ovary stalked; ovules many; style incurved, subulate at the apex, beardless; stigma small, terminal. Pod stalked, falcate, turgid, attenuated at the base and apex, compressed, torulose. —Species 35.—Tropics and subtropics.

1. Calyx not at all 2-lipped, splitting down the back to the base
   Calyx minutely 5-toothed at the tip. Seeds 6-8 .... 1. *E. indica.*
2. Calyx more or less 2-lipped, not splitting down the back to the base .... 2. *E. suberosa.*

Bark astringent; flowers mucilaginous and bechic.

The following species are used medicinally in China and the Malay Peninsula—*E. indica* Lam.—; In Indo China and the Philippine Islands—*E. indica* Lam., *E. ovalifolia* Roxb.—; in La Reunion, the West Indies, Mexico, Brazil—*E. indica* Lam.—; in Guiana—*E. corallodendron* Linn.—; in Guinea and Gambia— *E. senegalensis* DC.—; in the Gold Coast—*E. altissima* A. Chev., *E. senegalensis* DC.—; in South Africa—*E. caffra* Thunb., *E. humei* E. Mey., *E. rumeana* Spreng., *E. zeyheri* Harv.—.

1. **Erythrina indica** Lam. Encycl. Méthod. II (1786) 391.—PLATE 318.

A tree reaching 18 m. in height; bark thin, smooth, grey, armed with small conical dark-coloured prickles. Leaves 15-30 cm. long, deciduous; petioles, 10-15 cm. long, unarmed, readily disarticulating; stipules lanceolate, 1 cm. long, very caducous. Leaflets 10-15 by 9-12.5 cm. (the terminal leaflets the largest), membranous, broadly rhomboid-ovate, acute or acuminate, more or less stellately pubescent

when young, glabrous when mature, base truncate or rhomboidal; petiolules 8-13 mm. long; stipels thick, roundish, gland-like, persistent. Flowers appearing before the leaves, in dense racemes, 10-23 cm. long, arranged in clusters of 1-3 on a puberulous or tomentose rhachis; peduncles stout, woody, reaching 15 cm. long; pedicels 6 mm. long; bracts small, triangular, tomentose, deciduous; bracteoles 4 mm. long, subulate, tomentose. Calyx (before the expansion of the flower) tubular, 5-toothed at the tip, 2.5-3.2 cm. long, clothed with deciduous tomentum, mouth very oblique, the upper segment subulate, the 2 lateral similar but smaller, the lowest one longer and doubled over the others so as to form a blunt point to the bud, the calyx soon splitting down the back to the base and appearing like a spathe. Corolla bright red, 5-6.3 cm. long; standard 2.5-3.8 cm. broad; wings and keel-petals subequal, 1.3-2 cm. long. Stamens much exserted. Pods 12.5-30 cm. long, stalked, subcylindric, distinctly torulose. glabrescent. Seeds 4-8, subreniform, 2 by 1 cm., brown.

Distribution: Coast forests from Bombay to Malabar, and from the Sundribuns along the coast through Arakan, Pegu, and Tenasserim and in the Andamans and Nicobars; much planted for ornament.

The root is emmenagogue.—The bark is used in dysentery; cures "kapha" and "vata".—The leaves are bitter, hot, stomachic, anthelmintic; improve appetite; cure urinary discharges, inflammations.—The flowers are used in biliousness and ear troubles (Ayurveda).

Sushruta recommends the plant for the treatment of snake-bite.

The bark is used medicinally as febrifuge and anti-bilious. It is anthelmintic; and is useful as a collyrium in ophthalmia.

In the Konkan, the juice of the young leaves is used to kill worms in sores; and the young roots of the white-flowered variety are pounded and given with cold milk as an aphrodisiac.

The leaves are applied exeternally to disperse venereal buboes, and to relieve pain of the joints.

The fresh juice of the leaves is used as an injection into the ear for the relief of ear-ache, and as an anodyne in tooth-ache.

The Tamil vaidyans use the juice of the leaves mixed with castor oil for the cure of acute or chronic dysentery. Equal quantities of

the juice of the leaves and castor oil in drachm doses three times a day were given to about half a dozen cases of acute dysentery without any benefit (Koman).

The root, bark, and leaves are useless in the antidotal treatment of snake-bite (Mhaskar and Caius).

Bengal: Palitamadar, Palitamandar, Paltemandar—; *Berar:* Pangra—; *Bicol:* Cabrab—; *Burma:* Kathit, Pinlekathit—; *Cachar:* Madar—; *Canarese:* Bilivarijapa, Halivana, Halivara, Hongara, Hongaraka, Kempuvarijapa, Mandara, Mullumurige, Mullumutala, Nimbataru, Parijata, Parivala, Parivana, Salaki, Varijapa—; *Cantonese:* Hoi T'ing—; *Chinese:* Hai T'ung—; *Cutch:* Arduso—; *English:* Indian Coral-Tree, Mochi Wood—; *French:* Arbre au corail, Arbre à pois cafre, Baracara, Barracara, Bois de corail, Bois immortel, Bois rouge, Colorin, Cypre ă corail, Erythrine au corail, Immortel—; *Gujerati:* Bangaro, Panaraweo, Panarvo, Panderavo—; *Hindi:* Dadap, Mandara, Pangara, Pangra, Panjira, Pharad—; *Ilocano:* Bagbag—; *Indo China:* Thich dong, Vong, Vong nem—; *Kolami:* Birsing—; *Konkani:* Pangaro—; *Lambadi:* Karakalli—; *La Reunion:* Nourouc, Pignon d'Inde de l'Inde—; *Magahi:* Katheik—; *Malaya:* Hoi ting—; *Malayalam:* Kalyanamurikku, Karimurikku, Mandaram, Kulmurikku, Murikku, Nimbataru, Paribhadram—; *Marathi:* Mandar, Pangara, Pangra, Pangaru, Phandra—; *Mundari:* Edelkirum, Kirum, Kirumedel, Sirumedel—; *Nepal:* Phaledo—; *Pampangan:* Dapdap, Sulbang—; *Philippines:* Bubug, Cosindic, Dapedape, Selbang, Telbong—; *Portuguese:* Folhas da trindade, Ponguero—; *Sanskrit:* Bahupushpa, Kantaki, Kantakinshuka, Krimighna, Krimishatru, Mandara, Nimbataru, Palasha, Palitmandara, Paribhadra, Parijata, Prabhadraka, Raktakeshar, Raktakusuma, Raktapushpa—; *Santal:* Mararbaha—; *Saora:* Baditi—; *Sinhalese:* Erabadu, Ettabadu—; *Spanish:* Arbol del coral—; *Tagalog:* Cabrab, Carapdap, Casindic, Dapdap—; *Tamil:* Kaliyanamurukku, Kavir, Muchi, Mullumurukku, Murukku, Palasam, Palasu, Parisadam, Savusayam, Sinsugam, Vallai, Venittu—; *Telugu:* Badisa, Badita, Baridamu, Badida, Baditi, Mahameda, Modugu, Muchikatta, Paribhadrakamu, Paribhavyamu,

Parijatamu, Rohinamu—; *Tulu:* Pongare—; *Uriya:* Mondaro, Palodhua, Salotonya—; *Visayan:* Cabrab, Dapdap—.

2. **Erythrina suberosa** Roxb. Hort. Beng. (1814) 53.

A medium-sized deciduous tree with deeply cracked corky bark. Branches armed with white or pale yellow prickles. Young parts, undersurface of leaflets and inflorescence softly tomentose. Leaflets 7.5-20 cm. broad, often broader than deep, green and glabrous above, glaucous and matted with grey cottony pubescence beneath, rhomboid, entire or lobed, acute, base broadly deltoid. Racemes dense, terminating the branches. Calyx campanulate, becoming deeply 2-labiate. Standard 3.8-5 cm. long, oblong, narrowed into a short claw; keel-petals connate, less than half the length of the standard. Upper stamen free from low down. Pod 12.5-15 cm. long, terete, tapering at the ends, torulose; seeds 4-5, black.

Distribution: Punjab Plain, Upper Gangetic Plain, Rajputana, Central and S. India.

The bark is used in medicine. (Haines).

Almora: Rungra—; *Bhil:* Sambar—; *Bombay:* Pangara, Pangra—; *Burma:* Kathit—; *Canarese:* Kaduparivala, Mulluhalivara, Mulluhongara—; *Deccan:* Pangara—; *Garo:* Mandal—; *Gond:* Phangera—; *Gujerati:* Jagriyokhakharo, Jangarikhakhro, Janghario—; *Hindi:* Dauldhak, Madara, Nasut, Pangra, Rowanra, Rungra—; *Kharwar:* Farhud—; *Konkani:* Pangra—; *Kumaon:* Mandara—; *Kurku:* Gadaphassa—; *Lepcha:* Katiang—; *Marathi:* Pangra—; *Melghat:* Nangthada—; *Nepal:* Fullidha—; *Punjab:* Gulnashtar, Pariara, Thab—; *Tamil:* Mullumurukku, Munmurukku, Murukku, Vellaikkaliyanamurukku—; *Telugu:* Barijama, Barjapu, Mullumodyga, Munimoduga, Rohi, Rohitakamu—; *Uriya:* Bonopalodhua, Mushkombhu, Salotonya—.

Butea Koen. emend.

Trees or scandent shrubs. Leaves pinnately 3-foliolate, stipellate. Flowers orange, purple, rose or white, densely fasciculate; fascicles racemose or fasciculate-paniculate, or ample-paniculate. Calyx campanulate, the upper 2 teeth or lobes connate. Petals subequal or unequal; keel incurved and acute, or straight and obtuse.

Stamens 9+1, vexillar stamen free, the others connate; anthers uniform. Ovary sessile or stipitate, 2-4 (-7) ovulate; style incurved not bearded; stigma capitate or truncate. Pod 1-seeded.—Species 35.—Tropics of the Old World.

1. An erect tree .... 1. *B. monosperma.*
2. A climbing shrub .... 2. *B. superba.*

B. monosperma Kuntze., *B. superba* Roxb. are used medicinally in Indo China.

1. **Butea monosperma** O. Kuntze Rev. Gen. (1891) 202.—*Butea frondosa* Koenig ex Roxb. in As. Res. III (1783) 391, Pl. Corom. I (1795) 21, t. 21.—PLATE 319 (under *B. frondosa*).

An erect tree 12-15 m. high, with crooked trunk and irregular branches; bark rough, ash-coloured; young parts tomentose or downy. Leaves 3-foliolate; petioles 10-15 cm. long; stipules linear-lanceolate, deciduous. Leaflets coriaceous (the terminal 10-20 cm. long and about as broad as long, broadly obovate from a cuneate base, the lateral smaller, 10-15 by 7.5-10 cm., obliquely rounded at the base, inequilateral, the lower side the larger), all obtuse, glabrous above when old, finely silky and conspicuously reticulately veined beneath; petiolules 6 mm. long, stout; stipels subulate, deciduous. Flowers large, in rigid racemes 15 cm. long, 3 flowers together from the tumid nodes of the dark olive-green velvety rhachis; pedicels about twice as long as the calyx, densely brown-velvety; bracts and bracteoles small, deciduous. Calyx 13 mm. long, dark olive-green, densely velvety outside, clothed with silky hairs within; teeth short, the 2 upper connate, the 3 lower equal, deltoid. Corolla 3.8-5 cm. long, clothed outside with silky silvery hairs, orange or salmon coloured; standard 2.5 cm. broad; keel semicircular, beaked, veined. Pods stalked, 12.5-20 by 2.5-5 cm., thickened at the sutures, reticulately veined, argenteo-canescent; stalked 2 cm. long.

Distribution: Common throughout the greater part of India and Burma, up to 3,000 ft. and higher in the outer Himalaya, Khandesh Akrani up to 3,700 ft., hills of S. India up to 4,000 ft., Ceylon.

The root cures night blindness and other defects of sight; useful in elephantiasis.—The bark is hot, acrid, bitter, oily; appetiser, aphrodisiac, laxative, anthelmintic; useful in fractures of the bones,

diseases of the anus, dysentery, piles, hydrocele; cures ulcers and tumours.—The leaves are good for diseases of the eye.—The gum is astringent to the bowels; good in dysentery, stomatitis, cough, pterygium, corneal opacities; cures excessive perspiration.—The flowers are sweet, bitter, hot, acrid; astringent to the bowels; increase "vata"; cure "kapha", leprosy, strangury, gout, skin diseases, thirst, burning sensation; the juice is useful in eye diseases.—The fruit and seed are hot, dry, digestible, anthelmintic; aperient; used in urinary discharges, piles; cure "vata" and "kapha", skin diseases, tumours, abdominal troubles; given for scorpion-sting (Ayurveda).

The bark is an appetiser; lessens inflammation, biliousness, dysmenorrhœa; used in liver disorders, fractures, gonorrhœa; topically in piles and hydrocele; purifies the blood.—The leaf is an appetiser; very astringent, carminative, anthelmintic, aphrodisiac, tonic, lessens inflammation and lumbago; cures boils and piles.—The gum is acrid, astringent, aphrodisiac; tonic to the liver; used in diseases of the chest and lungs; useful in syphilis.—The flower is bitter, aphrodisiac, expectorant, tonic, emmenagogue, diuretic, astringent; good in biliousness, inflammation, burning urine, and gonorrhœa.—The fruit and seed are bitter and oily; anthelmintic; useful in piles, eye diseases, inflammation.—The lye is useful in enlargement of the spleen (Yunani).

The bark (Rheede) and the seeds (Charaka, Sushruta) are given for snake-bite. The ash of a young branch is prescribed in combination with other drugs in cases of scorpion-sting (Charaka).

The seeds are internally administered as an anthelmintic but regarding the reliance which can be put upon their action considerable difference of opinion prevails. Some medical men think that they can be advantageously substituted for santonine, while others view them as much less powerful. They have at the same time a warm purgative action which often proves injurious to their anthelmintic property. They are, however, largely used in the treatment of roundworm.

The powdered seeds are quite ineffective against hookworms, and their action against roundworms is very weak and erratic. The

oil from the seeds is quite ineffective against hookworms and round-worms (Caius and Mhaskar).

Externally, the seeds, when pounded with lemon-juice and applied to the skin, act as a rubefacient. They have been successfully used for the cure of the form of herpes, known as dhobie's itch.

When made into a paste, they are used as a remedy for ring-worm. Maggots are killed by sprinkling the powdered seeds over them.

The flowers are astringent, depurative, diuretic, and aphrodisiac; as a poultice, they are used to disperse swellings and promote diuresis and the menstrual flow. They are given to pregnant women in cases of diarrhœa, and are applied externally in orchitis.

The bark and seeds are useless in the antidotal treatment of snake-bite (Mhaskar and Caius). The ash of the young branch is not an antidote to scorpion-sting (Caius and Mhaskar).

The gum, known as Bengal or Butea Kino, has been used as an external astringent since the remotest times. It is also applied, when fresh, to ulcers and relaxed sore-throats.

The fresh juice is used in phthisis and hæmorrhagic affections. As an astringent it is given in diarrhœa and dyspepsia. In the Konkan it is prescribed in fevers.

The gum is a good astringent in diarrhœa and dysentery (Caius and Mhaskar).

The gum-kino does not contain enzymes (Fowler and Malandkar).

A chemical examination of the oil from the seeds was carried out by Tummin Katti and Manjunath (*Journ. Ind. Chem. Soc.;* VI, 1929).

Annam: Cay gieng gieng—; *Baigas:* Pharsa—; *Bundelkhand:* Chalcha—; *Bengal:* Palas, Polashi—; *Bihar:* Faras, Paras—; *Bombay:* Khakara, Khakharo, Palasa—; *Burma:* Pauk, Pin, Pouk, Poukpen—; *Canarese:* Brahmavriksha, Muttala, Muttuga, Palasa—; *Central Provinces:* Chinta, Chiula, Purohapalas—; *Ceylon:* Parasu—; *Cutch:* Khakar, Palas—; *Deccan:* Palas, Tesu—; *English:* Bastard Teak, Bengal Kino, Butea Gum—; *French:* Butée touffue, Erythrine monosperme—; *Gond:* Murr—;

No part of the plant is an antidote to snake-venom (Mhaskar and Caius) or to scorpion-venom (Caius and Mhaskar).

In Cambodia a decoction of the stem and leaves is considered emollient, and is used topically for piles. Water in which the plant has macerated is much recommended as a sedative.

Bengal: Latapalash—; *Bombay:* Palasavela, Palasi—; *Burma:* Poukgnwe—; *Cambodia:* Char—; *Canarese:* Muttuginaballi—; *Deccan:* Belpalas—; *Gond:* Samur—; *Gujarat:* Velkhakar—; *Koya:* Modugaige—; *Kurku:* Tunang—; *Marathi:* Beltivas, Palasavela, Palasvel, Yelparas—; *Monghyr:* Chihunt—; *Sanskrit:* Latapalasha—; *Santal:* Narimurup—; *Singrampur:* Baduri—; *Telugu:* Modugaige, Tigemoduga, Tivvamoduga—; *Uriya:* Noipolaso, Polasonoi—.

CANAVALIA DC.

Large twining perennials or biennials with stipellate 3-foliolate leaves and showy flowers. Calyx tubular; upper lip projecting, entire or emarginate, lower shortly 3-toothed. Corolla far-exserted; standard large, roundish; wings shorter, equalling the incurved obtuse keel. Stamens 1-adelphous, anthers uniform. Ovary obscurely stalked, many-ovuled; style incurved, beardless, stigma terminal. Pod large, linear or oblong, flat or turgid, with a longitudinal rib along each margin of the flattened upper suture.—Species 12.—Tropics.

1. Seeds 4-6 .... 1. *C. virosa.*
2. Seeds 8-20 .... 2. *C. ensiformis.*

C. ensiformis DC. is used medicinally in China and the Malay Peninsula.

1. **Canavalia virosa** Wight & Arn. Prod. 253.—*C. ensiformis* var. *virosa* Baker in Hook. f. Fl. Brit. Ind. II, 196.

A climbing perennial with usually reddish and tough stems. Terminal leaflets 3.8-10 cm. long, rarely 14 cm., broadly elliptic-oblong or broadly ovate with a rounded tip and short cusp or obtuse, rarely acute or subacuminate, base rounded; usually with few scattered hispid hairs beneath and petiolules hairy. Flowers lilac-

purple 3 cm. long, calyx puberulous 1.4 cm., standard sometimes 3 cm. broad not as long, with 2 strong calli above the claw. Wings 2.5 cm., adnate to keel at base, wavy. Ovary silky, tapering into the style. Ovules about 10. Pod attaining 18 by 3.8 cm. but often much smaller (10-12.5 cm.), nearly straight, brownish when ripe. Seeds 4-8, ellipsoid or somewhat ovoid, 1.5-1.8 cm. long, marbled with light and darker brown, hilum 1.3 cm. long.

Distribution: Bundelkhand and other parts of India.

The seeds are acrid, hot; tonic, appetiser, aphrodisiac, astringent to the bowels; remove "vata" and "kapha"; indigestible, produce intoxication and biliousness (Ayurveda).

The seeds are reputed poisonous; but the young pods are sometimes eaten (Haines).

Bengal: Kalanshim, Kathshim—; *Bombay:* Assambal, Gowara—; *Canarese:* Kadavare—; *English:* Wild Sword Bean—; *Hindi:* Sem—; *Malayalam:* Kattuvalamara—; *Marathi:* Abai—; *Mundari:* Tiun—; *Sanskrit:* Khadya, Kolashimbi, Kosaphala, Krishnaphala, Kushimbi, Kutsasrashimbi, Partapankapadika, Pustakashimbika, Shimbi, Sukarapadika—; *Tamil:* Kattuttambattan—; *Telugu:* Adavitamma, Karanuputige, Karutamma—; *Uriya:* Kolasimo, Nohupiyasimo—.

2. **Canavalia ensiformis** DC. Prodr. II (1825) 404; Wight Ic. t. 753.

A stout perennial or biennial twiner; stems and branches glabrous. Leaves 25-30 cm. long; petioles 15 cm. long, glabrous; stipules triangular, deciduous. Leaflets membranous, 7.5-15 by 5-10 cm., ovate, acute or shortly acuminate, apiculate, glabrous on both surfaces or nearly so, base rounded; petiolules 6 mm. long; stipels 3-4 mm. long, subulate, caducous. Flowers in lax 12-20-flowered curved axillary racemes 7.5-20 cm. long; pedicels 3 mm. long, usually in pairs from the swollen nodes; bracteoles minute, ovate, caducous. Calyx 10-16 mm. long, glabrous or faintly pubescent, the upper lip oblong, notched, one-third the length of the tube. Corolla 2.5-3.8 cm. long, lilac or white. Pods 15-30 cm. (or more) long, 2.5-5 cm. wide, slightly incurved, shortly pointed, glabrescent,

strongly 3-keeled. Seeds 8-20, reddish brown or white, about 2.5 cm. long.

Distribution: Commonly cultivated throughout India and everywhere in the tropics.

The fruit is sweetish, acrid; cooling, indigestible; tonic; appetiser; useful in burning sensations, biliousness, ulcers (Ayurveda).

Bengal: Makhamshim, Mekhun, Shemgachha—; *Bombay:* Gaivara—; *Burma:* Paikalag, Poinoungni—; *Canarese:* Kadavare, Sambe, Tamateballi—; *Chinese:* Tao Tou—; *Deccan:* Burrashim, Kudsumberabye—; *English:* Broad Bean, Patagonian Bean, Sword Bean—; *Gujerati:* Gavria, Paraholiya, Tarbodianivel, Tarvardi—; *Housa:* Barankachi—; *Hindi:* Gojiasema, Kadsambu, Khadsambal, Lalkudsumbal, Safedkudsumbal, Sema, Suarasema—; *Kano:* Danzago—; *Leyte:* Magtambocao—; *Malayalam:* Kanavala, Kattuvalamarakkaya, Valamara—; *Marathi:* Abai, Gavara, Gavari, Govari, Khadasambala, Kisamari—; *North-West Provinces:* Sem—; *Porebunder:* Talvardi, Tawardi, Tawardivel—; *Punjab:* Sem—; *Sakalave:* Jangala, Voavahibe—; *Sanskrit:* Asishimbi, Brihatshimbi, Khadgashimbi, Koshaphala, Mahashimbi, Nilashimbika, Shimbi, Sthulashimbi—; *Santali:* Tihon—; *Sinhalese:* Walawara—; *Tagalog:* Pataningdagar—; *Tamil:* Kattuttambattan, Kodittambattan, Kolhiyavarai, Kottuttambattam, Peyavarai, Sivapputtambattai, Tambattai, Valavarai, Vellaittambattai—; *Telugu:* Adavitamma, Ettatamma, Karanuputige, Karutamma, Shimbi, Tamba, Tamma—; *Uriya:* Kolasimo, Nohuniyasimo—; *West Indies:* Overlook Bean, Sword Bean—.

PUERARIA DC.

Twining herbs or shrubs. Leaves pinnately 3-foliolate; stipules herbaceous, produced below their insertion in some species. Leaflets entire or sinuately 3-lobed, stipellate. Flowers in long often compound racemes; pedicels densely fascicled along a nodiform rhachis; bracts and bracteoles small. Calyx-teeth long or short, the 2 upper connate into one, which is entire or 2-dentate. Corolla exserted; standard obovate or suborbicular with inflexed auricles at

the base, equalling in length the obtuse wings and keel. Stamens monadelphous; anthers uniform. Ovary subsessile; ovules many; style filiform, inflexed above, beardless; stigma small capitate. Pod linear, more or less flattened.—Species 15.—Tropical Asia to Japan.

The flowers are used as diaphoretic and febrifuge. The roots are considered thirst relieving, antifebrile, antiemetic, and counter-poisonous.

The following species are used medicinally in China *P. hirsuta* Kuntz—; in Indo China—*P. thomsoni* Gagnep.—; in the Philippine Islands—*P. phaseoloides* Benth.—.

OFFICIAL:—The starch prepared from *P. hirsuta* Matsum. in Japan.

1. **Pueraria tuberosa** DC. Prodr. II (1825) 240; Wight Ic. t. 412.—PLATE 321.

A large twiner; root tuberous; stem shrubby. Leaves 3-foliolate; petioles 10-15 cm. long, more or less pubescent; stipules 4 mm. long, ovate-oblong, cordate. Leaflets subcoriaceous, 12.5-20 by 11.5-18 cm. (the terminal broadly ovate, acuminate, equal-sided, cuneate at the base, the lateral ovate-oblong, inequilateral, truncate at the base), glabrescent above, silky beneath; petiolules 4.5-6 mm. long; stipels small, subulate. Flowers in lax (sometimes panicled) leafless racemes, 15-30 cm. long; pedicels 2-3 mm. long, silky-pubescent, fascicled along a more or less pubescent rhachis; bracteoles 1.5 mm. long, oblong, silky. Calyx 6-8 mm. long, densely silky; teeth shorter than the tube, oblong, obtuse, ciliate. Corolla bluish; standard 1.3 cm. long and as broad as long, spurred. Pods 5-7.5 cm. long, membranous, flat, constricted between the seeds, clothed with long silky bristly brown hairs. Seeds 3-6.

Distribution: From the W. Himalaya to Sikkim, up to 4,000 ft. in Kumaon, lower hills of the Punjab, Mt. Abu, hilly tracts of Bengal and S. India.

The flower is cooling and aphrodisiac.—The tuber is sweet, oily, cooling; aphrodisiac, tonic, galactagogue, diuretic, alterative; clears the voice; cures leprosy, biliousness, diseases of the blood, "vata", burning sensation, urinary discharges; indigestible, causes "kapha" (Ayurveda).

The root is given as a demulcent and refrigerant in fevers.

Peeled and bruised into a cataplasm it is used to reduce swellings of the joints.

The Mundas crush the root and rub it on the body in fever and rheumatism.

In Nepal it is employed as an emetic and tonic, and is also believed to be lactagogue.

Almora: Bisalu—; *Bengal:* Shimiabatraji—; *Bhil:* Bhoikohola, Udkhya—; *Bombay:* Dari, Darni—; *Dehra Dun:* Saral, Sarur, Sural—; *Gond:* Patal—; *Gujarat:* Karwinai, Khakarvel, Vidari, Vidarikand—; *Garhwal:* Sirala—; *Hindi:* Badar, Bedarikand, Bilaikand, Billi, Bodar, Bolaikand, Dedarikand, Patalkand, Patalkohnda, Pona, Siali, Sural, Surur, Tirra—; *Haldwani:* Biralu—; *Kumaon:* Bilaikand, Bili, Biralipanwa, Biralipuna—; *Marathi:* Badra, Bharda, Pithana—; *Merwara:* Ghorabel—; *Mundari:* Birkakaru, Otekakaru—; *Nepal:* Biralikund—; *North-Western Provinces:* Badar, Sarar, Sarwala, Siali, Sural—; *Paharia:* Debrelara—; *Porebunder:* Fagdanovelo, Fagianigand, Fagio—; *Punjab:* Badar, Saloha, Salor, Siali, Sural—; *Rajputana:* Gorabel—; *Ramnagar:* Siralu—; *Saharanpur:* Saral, Sarur, Sural—; *Sadani:* Patalkora—; *Sanskrit:* Bhukushmandi, Bhumikushmand, Gajavajipriya, Gajeshta, Gandhaphala, Ikshugandha, Kandapalash, Kroshtri, Kshirashukla, Kshiravalli, Kundapalasha, Payasvini, Shrigalika, Shukla, Sita, Svadukanda, Svadulata, Triparna, Vajivallabha, Vidali, Vidarika, Vidarikanda, Vrikshavalli, Vrishyakanda, Vrishyavallika, Vrishyavardhini—; *Santal:* Jangtirra, Patalkohnda, Tirra—; *Telugu:* Darigummadi, Kubayatige—.

PHASEOLUS Linn.

Herbs rarely woody at the base, twining, prostrate or suberect. Leaves pinnately 3-foliolate (very rarely 1-foliolate); stipules persistent, striate. Leaflets stipellate. Flowers in axillary racemes; rhachis nodiform; bracts usually caducous; bracteoles often broader than the bracts and more persistent. Calyx campanulate, the 2 upper connate or free. Corolla much exserted; standard suborbicular; wings obovate (rarely oblong); keel produced into a very long beak

which forms a complete or nearly complete spiral. Stamens diadelphous; anthers uniform. Ovary subsessile; ovules many; style within the beak of the keel and twisted with it, usually bearded down the side below the very oblique stigma. Pod linear or falcate, subterete or compressed, 2-valved, more or less septate between the seeds.—Species 160.—Tropical and warm temperate regions.

A. Stipules small, basifixed. Pods 13-20 mm. broad, subcompressed. Keel prolonged into a complete spiral
    1. Biennial .... 4. *P. lunatus.*
    2. Perennial .... 6. *P. adenanthus.*
B. Stipules inserted above the base. Pods under 6 mm. thick. Keel prolonged into a complete spiral
    1. Leaflets deeply 3-lobed with the central division ligulate .. 5. *P. aconitifolius.*
    2. Leaflets more or less deeply 3-lobed with the central division spathulate .... 1. *P. trilobus.*
    3. Leaflets membranous with scattered appressed hairs on both sides .... 3. *P. mungo.*
    4. Leaflets dark green, membranous .... 2. *P. radiatus.*

The leaves are considered sedative, antibilious and tonic. The roots are narcotic. The seeds are diuretic and are used in dropsy and cephalalgia.

The following are used medicinally in Europe—*P. vulgaris* Linn.—; in China—*P. mungo* Linn., *P. mungo* var. *subtrilobata* Fr. & Sav.—; in Indo China—*P. lunatus* Linn., *P. radiatus* Linn.—; in the Philippine Islands—*P. lunatus* Linn., *P. mungo* Linn., *P. vulgaris* Linn.—; in Brazil—*P. compressus* DC., *P. derasus* Schrank., *P. lunatus* Linn., *P. vulgaris* Linn.—; in Guinea—*P. lunatus* Linn.—; in South Africa—*P. mungo* Linn.—.

1. **Phaseolus trilobus** Ait. Hort. Kew. ed. 1, III (1789) 30; Wight Ic. t. 94.—Plate 322.

Annual or perennial; stems numerous from a woody rootstock, 0.6-0.9 m. long, prostrate, wiry, slender, not at all twining, glabrous or more or less hairy. Leaves 3-foliolate, petioles 3.8-7.5 cm. long, grooved, glabrous or with a few scattered hairs; stipules variable in length, 4-16 mm. long, ovate-oblong, subacute, attached above the base, ciliate. Leaflets 1.3-2.5 cm. long, usually as broad as long, commonly 3-lobed (the middle lobe the largest and oblong, broadly spathulate, obtuse, the lateral lobes often oblong or more or less spathulate, obtuse or subacute), all pale green, membranous, glabrous

or with a few hairs on the nerves, base subacute; petiolules 1.5-2.5 mm. long, hairy; stipels small, lanceolate, acute. Flowers in subcapitate, few-flowered racemes; peduncles 10-23 cm. long, glabrous or sparsely hairy; pedicels 2.5 mm. long; bracts ovate, acute, deciduous; bracteoles beneath the calyx 3 mm. long, linear-lanceolate, ciliate, deciduous. Calyx 2.5 mm. long, glabrous; teeth minute, deltoid. Corolla 5-6.4 mm. long, yellow. Pods 2.5-5 cm. long by 3 mm. diam., straight, subcylindric, glabrous or sparingly hairy, slightly recurved. Seeds 6-12.

Distribution: On the Himalaya, up to 7,000 ft. and southward to Ceylon, Burma.—Malay Islands, Afghanistan, Abyssinia, Nubia.

The fruit is cooling, dry, bitter, with a flavour; aphrodisiac, astringent, styptic, anthelmintic; good for the eyes; cures consumption, inflammations, fever, burning sensation, thirst, "tridosha", piles, dysentery, cough, gout, biliousness.—The juice of the plant is prescribed in rat-bite fever (Ayurveda).

The leaves are considered tonic and sedative; they are used in cataplasms for weak eyes.

In Bihar they are administered in decoction in cases of irregular fever.

The fruit is recommended for the treatment of snake-bite and scorpion-sting (Charaka, Sushruta).

The fruit is useless in the treatment of snake-bite (Mhaskar and Caius) or scorpion-sting (Caius and Mhaskar).

Bengal: Mugani—; *Bambay:* Arkmut, Mukuya—; *Canarese:* Kohasaru—; *Gujarat:* Adabaumagi, Adavada, Magavala—; *Hindi:* Mugani, Mugawana, Mungani, Trianguli—; *Marathi:* Arkamath, Janglimath, Ranmath, Ranamuga—; *Porebunder:* Magamathi—; *Sanskrit:* Aranyamudga, Hrasva, Kakamudga, Karanjika, Koshila, Kshudrasaha, Kurangika, Marjaragandhika, Mudgaparni, Saha, Shimbi, Shimbiparni, Shimbiparnika, Shurpaparni, Vanajaringini, Vanamudga, Vanodbhava, Vanya—; *Sinhalese:* Binme—; *Tamil:* Naripayar, Panipayar—; *Telugu:* Pillippersara—.

2. **Phaseolus radiatus** Linn. Sp. Pl. (1753) 725.—PLATE 324 (under *P. mungo* var. *radiatus*).

Stems annual, 30-60 cm. high, clothed with brownish silky hairs. Leaflets dark green, membranous, 5-10 cm. long. Flowers yellow. Pods subcylindric, 3.8-6.3 cm. long. Seeds 10-15, green.

Distribution: Extensively cultivated all over India.

The seed is sweet, oily; laxative, aphrodisiac, tonic, appetiser, diuretic, galactagogue; cures "vata", piles, asthma; good for the heart and in fatigue; causes thirst, "kapha", and leprosy-like skin diseases (Ayurveda).

The seed is aphrodisiac, tonic, diuretic, galactagogue, styptic; useful in scabies, leucoderma, gonorrhœa, pains, epistaxis; indigestible (Yunani).

The seeds are much used in medicine, both internally and externally, in paralysis, rheumatism and affections of the nervous system. Also used in fever, considered hot and tonic, useful in piles, affections of the liver and cough.

The root is said to be narcotic. It is prescribed by the Santals as a remedy for aching bones.

In Indo China, the seeds are considered diuretic; they are occasionally prescribed for dropsy and cephalalgia.

The fruit is recommended for the treatment of snake-bite and scorpion-sting (Sushruta).

The fruit is equally useless in the treatment of either snake-bite (Mhaskar and Caius) or scorpion-sting (Caius and Mhaskar).

Arabic: Mash—; *Canarese:* Hasaru, Uddu—; *Bengal:* Mash Kulai, Tircorai Kalai—; *Deccan:* Kala urd, Udid, Urud—; *Gujerati:* Adad, Arad—; *Hindi:* Dord, Thikiri, Urid, Urud—; *Indo China:* Dau xanh, Lao dau, Luc dau—; *Konkani:* Urid—; *Kumaon:* Urd—; *Madras:* Ulundu—; *Malayalam:* Cherupoyara—; *Marathi:* Maga, Udid—; *Persian:* Benumash—; *Punjab:* Mah, Mash, Urad—; *Sanskrit:* Baladhya, Bali, Bijaratna, Dhanyamasha, Dhanyavira, Hurita, Kuruvinda, Mansal, Masha, Pitribhojana, Pitrya, Vrishankur—; *Santal:* Birsang, Ramra—; *Sind:* Maga, Mah, Urad—; *Sinhalese:* Ulundumae—; *Tamil:* Paunippayare, Patchaippayarai—; *Telugu:* Karuminumulu, Minumulu, Patchapesalu—; *Urdu:* Mash—.

3. **Phaseolus mungo** Linn. Mant. 101, var. *Roxburghii* Prain in Journ. As. Soc. Beng. 66 (1898) 423.—PLATE 323.

Stems longer and more trailing than those of the *mung* (*P. radiatus*); whole plant much more hairy with reddish brown pubescence which gives the foliage a lighter tint; leaves larger; the pods are nearly erect, very hairy, and with fewer seeds, which are larger and longer than those of the *mung*, and usually dark brown, and sometimes of a dull greenish grey colour.

Distribution: Vastly cultivated.

The seeds are acrid, sweet, cooling, digestible, laxative, antipyretic; cure biliousness, blood diseases, "kapha"; good for the eyes; cause much flatulence (Ayurveda).

The seeds have a good taste; tonic, astringent to the bowels; enrich the blood; good in fevers, eye troubles, headache, nose complaints, throat inflammations, bronchitis, kidney diseases; cure biliousness and diseases of the blood (Yunani).

The pulse is considered cool, light, and astringent. It is used to strengthen the eye and as a diet in fever.

The Sutos rub the powdered bean into scarifications over tumours and abscesses to promote suppuration.

Arabic: Mashedamij—; *Banda:* M'Boyo—; *Bengal:* Bulat, Ghora muga, Hari mung, Kheruya, Krishna muga, Mung, Mug, Sona muga—; *Bombay:* Mung—; *Burma:* Pai, Painouk—; *Canarese:* Hesaru, Hesarubele—; *Central Provinces:* Mung, Mungu—; *Ceylon:* Pasipayiru—; *Chinese:* Lu Tou—; *English:* Green Gram, Mung—; *Gujarat:* Lilamag, Mag—; *Hindi:* Harrimung, Mug, Mung, Munj, Pessara, Urid, Wallimung—; *Kalat:* Mah—; *Konkani:* Chiringo, Mug—; *Kumaon:* Mung—; *Mandjia:* Babara, Bakalangoua, Bekoue, Dakone, Golo, Gouakangadila, Haria, M'Bale—; *Marathi:* Mug—; *Mundari:* Henderambara, Rambra, Ramra—; *Nepal:* Mu, Mung—; *North-Western Provinces:* Chhimi, Chikan, Mung—; *Persian:* Mung, Nabnmash—; *Philippines:* Bolaton—; *Portuguese:* Grao de pulha, Mungo, Udida, Urida—; *Punjab:* Muji, Mung, Mungi—; *Pushtu:* Mai—; *Rajputana:* Mung—; *Sanskrit:* Bhuktiprada, Hayananda, Mudga, Rasottama, Supashreshtha, Suphala, Vajibhojana,

Varnarha—; *Santal:* Mung—; *Sind:* Mah, Mung—; *Sinhalese:* Munmae, Muneta—; *Spanish:* Frisol menudo, Mongo de la India—; *Suto:* Lehlodi—; *Tagalog:* Balatong, Mongos—; *Tamil:* Patchai payara, Siru payara—; *Telugu:* Patcha pessara, Wuthulu—; *Urdu:* Mung—; *Uriya:* Dhalamug, Kalamug, Saulimug—; *Visayan:* Mungo—;

4. **Phaseolus lunatus** Linn. Sp. Pl. (1753) 724.

A tall biennial twining plant, bearing racemes of many small greenish yellow flowers. Bracteoles minute. Petals hairy outside. Pods 5-7.5 cm. long, flat, the upper suture recurved, the lower broadly rounded. Seeds large, 2-4, white or mottled.

Distribution: Cultivated throughout India.—A native of Brazil.

The pulse is used as a diet in fever. It is considered astringent.

This species sometimes exhibits markedly poisonous properties.

Hydrocyanic acid and a toxic glucoside, phaseolunatin, have been isolated from the seeds.

Afrikaans: Sewejaarsboontjie—; *Bengal:* Bunburbutty—; *Ceylon:* Pitanga—; *English:* Burma Bean, Duffin Bean, Hibbert Bean, Java Bean, Lima Bean, Lima Kidney Bean, Madagascar Bean, Rangoon Bean, Sugar Bean, Tonga Bean—; *French:* Haricot du Cap. Pois d'Achery—; *Ga:* Akpatramor—; *Gold Coast:* Butter Bean, Lima Bean—; *Indo China:* Dau day, Dau ke bac, Day ngu, Dau rua, Dau vang—; *Krobo:* Akortrormore—; *La Reunion:* Pois d'Achery, Pois Adam, Pois amer, Pois doux, Pois de sept ans—; *Madagascar:* Kalamaka, Kalamakabe—; *Malinke:* Toubabou sosso—; *Mandjia:* Ngualfili—; *Philippines:* Haba, Zabbache—; *Punjab:* Lobiya—; *Sinhalese:* Pothudhambala—; *South Africa:* Burma Bean, Civet Bean, Java Bean, Lima Bean—; *Tagalog:* Patani—; *Twi:* Adua, Apateram—; *Visyan:* Patani—.

5. **Phaseolus aconitifolius** Jacq. Obs. Bot. pt. 3 (1768) 2, t. 52.

Closely allied to *P. trilobus* with which it agrees in flowers and general habit. Stems more copiously clothed with loose deflexed fine brownish hairs, slender, suberect or diffuse. Stipules much smaller and narrower than in *P. trilobus,* lanceolate. Leaflets deeply

3-lobed with the central division ligulate. Peduncles hairy, like the stems; bracteoles linear, twice as long as the calyx, their setaceous ciliated tips protruding beyond the buds. Racemes capitate, flowers minute. Pods rather stouter than in *P. trilobus* and seeds larger.

Distributiton: Himalayas to Ceylon, tropical region up to 4,000 ft. in the North-West.

The seed is acrid, sweet; tonic, stomachic, fattening; useful in leprosy, "kapha" and vata", tumours, fevers, vomiting, burning sensations, tuberculosis; causes constipation, flatulence, intestinal worms (Ayurveda).

The root is narcotic.

The pulse is used as a food in cases of fever.

Assam: Mattikalaie—; *Bengal:* Banmudgakheri—; *Canarese:* Madki—; *Central Provinces:* Mot—; *Deccan:* Mote, Mut—; *English:* Dew Bean, Moth Bean—; *Gujerati:* Math, Mut—; *Hindi:* Bhringga, Mat, Methkalai, Moth, Mothi, Urad—; *Marathi:* Math, Matha, Matki—; *North-West Provinces:* Moth—; *Persian:* Adas, Mashehindi—; *Porebunder:* Math—; *Punjab:* Moth—; *Sanskrit:* Amrita, Aranyamudga, Bassunta, Khandi, Krimilaka, Kulinaka, Madyaka, Makushtha, Makushthaka, Mapashtha, Mayastha, Mudjashtaka, Nigudhaka, Rajamudga, Vallimudga, Vanamudga, Varaka, Vasunta—; *Santal:* Birmoch, Birmung, Moch—; *Sind:* Mohar, Muhri—; *Tamil:* Tulkapyrai—; *Telugu:* Kunkumapesalu, Minumulu—.

6. **Phaseolus adenanthus** Meyer Prim. Fl. Esseq. (1818) 239.—*P. rostratus* Wall. Pl. As. Rar. t. 63; Wight Ic. t. 34.

A perennial herbaceous twiner with glabrous stems. Leaves distant; rhachis 7.5-10 cm., stout, stipules small, oval; leaflets 6.3-11.5 cm., rhomboid-oval, subacute, apiculate, glabrous or slightly pubescent, the lateral ones dilated in lower half. Flowers large, over 2.5 cm., few, on short pedicels with a large round gland at base, solitary or in pairs, closely placed at end of an axillary peduncle about as long as leaves, bractlets 2, immediately beneath flowers, ovate, acute, striate. Calyx, finely pilose; keel very long, twisted into a complete spiral. Pod 12.5-15 by 1 cm. wide, compressed, shortly beaked,

falcately curved, glabrous. Seeds 12-16, nearly circular, 6 mm., flat, black.

Distribution: Cosmopolitan in the tropics.

A decoction is used in bowel complaints and stricture.

Bengal: Banbarbati—; *Bombay:* Hullowla, Kullounda—; *Sanskrit:* Aranyamudga—; *Telugu:* Karalasana, Karu alachanda—.

VIGNA Savi.

Twining or prostrate, rarely suberect herbs. Leaves pinnately 3-foliolate; stipules basifixed, or rarely produced below their insertion. Leaflets stipellate. Flowers in racemes at the upper part of an axillary peduncle; pedicels fascicled on the nodiform rhachis; bracts and bracteoles small, caducous. Calyx-teeth distinct or the 2 upper connate. Corolla much exserted; standard orbicular, auricled at the base; wings shorter than the standard; keel equalling the wings, incurved, not beaked, or prolonged into an incurved beak not making a perfect spiral. Stamens diadelphous; anthers uniform. Ovary sessile; ovules many; style filiform or thickened or dilated above, bearded along the inner face; stigma very oblique. Pod linear, straight or incurved, subterete, septate between the seeds.—Species 50—Tropics.

V. catiang Walp. is used medicinally in China, Cambodia, and Brazil.

1. **Vigna catiang** Walp. in Linnaea 13 (1839) 533.—PLATE 325.

A suberect or twining annual, with glabrous stems. Stipules 8-13 mm., attached above the base, ovate-lanceolate, persistent. Leaflets 7.5-15 cm. long, entire or slightly lobed, broadly or narrowly ovate, the lateral ones obliquely so. Flowers few, in subcapitate racemes; peduncles often exceeding the leaves; bracts attached above the base, deciduous. Calyx under 1.3 cm., deltoid-cuspidate. Corolla yellow or reddish, twice the calyx. Pod 10-60 cm. long, slightly depressed between the seeds.

Distribution: Extensively cultivated.

The seeds are acrid, dry, with a good flavour; laxative, appetiser, galactagogue, tonic, aphrodisiac, diuretic; indigestible, cause flatulence (Ayurveda).

The pulse is considered hot, dry, and diuretic. It is used to strengthen the stomach.

In Las Bela the seeds are boiled and eaten; it is considered a good food and to destroy worms in the stomach (Hughes-Buller).

The seed and the pod refuse are used medicinally in China and Malaya.

In Cambodia the pulse is considered antibilious and is prescribed in liver complaints with jaundice.

Akim: Adua—; *Assam:* Mahorpat, Urohi—; *Bengal:* Barbati, Chim, Ramhikolai, Shim—; *Bombay:* Chola, Chowli, Gatval, Hurrea, Lobeh, Safedlobeh—; *Brazil:* Feijocinho da India, Feijoeiro frade—; *Cambodia:* Sandek bai—; *Canarese:* Alasandi, Kursanpayaro, Tadagunny—; *Chinese:* Chiang Tou—; *Deccan:* Chowli, Lobeh—; *English:* Blackeye Pea, Catiang Pea, Chowlee, Cow Pea, Jerusalem Pea, Marble Pea, Tonkin Pea, Yard-long Bean—; *Ewe:* Gelenggeng—; *Ga:* Yoror—; *Gujarat:* Chola, Chora—; *Hausa:* Wake—; *Hindi:* Bora, Chowli, Lobia, Rausa, Rawas, Rianish, Souta—; *Konkani:* Alsando, Vervil—; *Krepi:* Ayi—; *Krobo:* Yoror—; *Kumaon:* Lobiya, Raish, Riansh, Riensh, Souta—; *La Reunion:* Voeme—; *Malayalam:* Alasendi—; *Manila:* Sitao—; *Marathi:* Chaoli—; *Mundari:* Budi, Cakontarambara, Cakontaramra, Dangbudi, Dangrambra, Pundiramra—; *North-Western Provinces:* Lobia, Rausa, Rawas, Souta—; *Ormara:* Mak—; *Oudh:* Lobia, Rausa, Rawas, Souta—; *Persian:* Lobiya—; *Portuguese:* Feijao chicote, Feijao fradinho—; *Punjab:* Chota, Harwanh, Lobiya, Rawan, Rawangan, Rawangi, Rawongi, Roin, Souta—; *Sadani:* Budi, Cakontabudi, Cakorbudi, Ghangara, Kauramra, Saradataramra—; *Sanskrit:* Chapala, Chavala, Dirghabija, Dirghashimbi, Dvijasapta, Marutkara, Mahamasha, Kshudhabhijanaka, Nilamasha, Nishpava, Nripamasha, Nripochita, Rajamasha, Rishpava, Sitamasha, Sukumara, Varvata—; *Santal:* Ghangra—; *Sind:* Chaunro—; *Sinhalese:* Diyamekaral, Hawarime, Limae, Mekaral, Polomne—; *Tagalog:*

Quibal—; *Tamil:* Caramunnipayira—; *Telugu:* Alusundi, Boberlu, Bobra, Duntuppesalu—; *Twi:* Akitereku, Asedua, Asekorkor—; *Visayan:* Balatong, Hamtac, Laston—.

CLITORIA Linn.

Herbs or shrubs erect or climbing. Leaves pinnate, 3-many-foliolate; stipules persistent, striate. Leaflets stipellate. Flowers showy, axillary, solitary, fascicled or racemose; bracts persistent, stipule-like; bracteoles usually larger, striate, persistent. Calyx tubular; the 2 upper teeth subconnate. Corolla much exserted; standard large erect, emarginate, narrowed and not appendiculate at the base; wings falcate-oblong, spreading, adhering to the middle of the keel; keel shorter than the wings, incurved, acute. Stamens monadelphous or diadelphous; anthers uniform. Ovary stalked; ovules many; style elongate, incurved, more or less flattened, bearded along the inner side. Pod stalked, linear, compressed or turgid.—Species 35.—Tropics and subtropics.

C. ternatea Linn. is used medicinally in Indo China, the Philippine Islands, and Madagascar.

1. **Clitoria ternatea** Linn. Sp. Pl. (1753) 753.—PLATE 326.

A perennial twining herb; stems terete, more or less pubescent. Leaves imparipinnate; petioles 2-2.5 cm. long; stipules 4 mm. long, linear, acute. Leaflets 5-7, subcoriaceous, 2.5-5 by 2-3.2 cm. elliptic-oblong, obtuse, glabrous or with a few short appressed hairs, base obtuse or acute; stipels filiform. Flowers axillary, solitary; pedicels 8-13 mm. long; bracts small, linear; bracteoles 6-13 mm. long, roundish, obtuse. Calyx 1.3-2 cm. long; teeth lanceolate, shorter than the tube. Corolla 3.8-5 cm. long; standard bright-blue or sometimes white, with an orange centre. Pods 5-10 cm. by 8-13 mm., flattened, nearly straight, sharply beaked, sparsely appressedly hairy. Seeds 6-10, yellowish brown, smooth.

Distribution: Cosmopolitan in the tropics.

1. *White-flowered variety.*—The root has a sharp bitter taste; cooling, acrid; laxative, diuretic, alexiteric, anthelmintic; tonic to the brain; good for eye diseases, ulcers of the cornea, tuberculous

glands, elephantiasis, headache; cures "tridosha", leucoderma, burning sensation, pains, biliousness, inflammations, ulcers, "kapha", snake-bites.

2. *Blue-flowered variety.*—The root is bitter and has all the properties of that of the white-flowered variety; in addition, it is aphrodisiac; cures dysentery, severe bronchitis, asthma, consumption; useful in ascites and abdominal enlargement (Ayurveda).

The root is purgative and diuretic; useful in ascites (Yunani).

The root is considered laxative and diuretic, useful in ascites and fevers.

In the Konkan, the root-juice is given in cold milk to remove the phlegm in chronic bronchitis; it causes nausea and vomiting. The juice of the root of the white-flowered variety is blown up the nostrils as a remedy for hemicrania.

The root-bark is diuretic and laxative; a decoction is given as a demulcent in the irritation of the bladder and urethra.

The seeds are purgative and aperient.

The infusion of the leaves is used for eruptions.

The juice of the leaves, mixed with that of green ginger, is administered in cases of colliquative sweating in hectic fever.

The juice of the leaves mixed with common salt is applied warm all around the ear in ear-aches, especially when accompanied with swelling of the neighbouring glands.

In Madagascar, the Betsimisaraka use the root as an emetic, and the seeds as a purgative.

The seeds are cathartic and the root diuretic. The powdered seeds in combination with ginger powder were found to have laxative action. Some of the patients complained of griping pain in the lower abdomen (Koman).

The root, stem, and flower are recommended for the treatment of snake-bite (Charaka, Sushruta, Vagbhata, Rasaratnakara, Yogaratnakara) and scorpion-sting (Charaka, Sushruta, Rasaratnakara, Vaidyavinoda).

All parts of the plant are equally useless in the antidotal and symptomatic treatment of snake-bite (Mhaskar and Caius) and scorpion-sting (Caius and Mhaskar).

Annam: Cay dau biec—; *Arabic:* Bazrulmazariyunehindi, Mazariyunehindi—; *Bengal:* Aparajita, Uparajita—; *Betsimisaraka:* Famehifary, Famehifory—; *Bombay:* Gokaran, Gokarna, Kajali—; *Burma:* Bukiyu, Oungmaiphyu, Painoungni—; *Canarese:* Girikarniballi, Sankhapushpaballi—; *Deccan:* Ghutti, Kalizer, Phiki—; *Gold Coast:* Blue Pea—; *Gujarat:* Garani, Koyala—; *Hindi:* Aparajit, Aparajita, Kajina, Kalina, Kalizer, Kavathenthi, Khagin, Kowa, Wowatheti, Shobanjan, Vishnukranti—; *Indo China:* Dau biec, Diep dau—; *Konkani:* Cazuli—; *La Reunion:* Pistache marronne bleue—; *Madagascar:* Vahintsikomba, Vahitsikomba—; *Malay:* Kachang telang—; *Malayalam:* Aral, Kakkanamkoti, Sankhankuppi, Sankhapushpam—; *Marathi:* Gokaran, Gokarni, Gokurna, Kajli, Sholonga—; *Persian:* Darakhtebikhehayat, Tukhmebikhehayat—; *Portuguese:* Fula criqua—; *Pushtu:* Aparajita, Aprajit, Dhanattar, Ghiria, Isband, Kalzar, Kawatunti, Shami, Vishnukante—; *Sanskrit:* Aparajita, Ashvakshurardikarni, Asphota, Bhadra, Bhumilagna, Dadhipushpika, Gardabhi, Gavadini, Gavakshi, Girikarnika, Girishalini, Gokarnika, Katabhi, Kinihi, Nagaparyayakarni, Nilagirikarni, Romavalli, Shveta, Shvetsyanda, Shvetavarata, Sinhapushpi, Sitapushpa, Supushpi, Suputri, Vishnukantri, Vishnukranta, Vryshapadi—; *Sinhalese:* Katarolu, Nilkatarodu, Kattarodu—; *Tagalog:* Calocanting, Pukingang—; *Tamil:* Kakkanam, Kakkattan, Kannikkodi, Karisanni, Karkkurattai, Karudakkovai, Karudattondai, Karuvilai, Kaurigeni, Kavalai, Kemachi, Kevari, Kigini, Kiriganni, Kiruttini, Minni, Taruganni, Uyavai, Viranu—; *Telugu:* Dintena, Nallavusinitige—; *Tulu:* Sanka—; *Urdu:* Mazeriyunihindi—; *Uriya:* Onasi, Oporajita—; *Visayan:* Colocanting—.

Dolichos Linn.

Twining prostrate or suberect herbs. Leaves pinnately 3-foliolate; stipules small. Leaflets stipellate. Flowers axillary, racemose or fascicled; bracts and bracteoles striate, very caducous. Calyx campanulate; teeth usually short, the 2 upper connate into one entire or emarginate one. Corolla much exserted, its petals usually

equal in length; standard orbicular, with inflexed auricles at the base; keel obtuse or rostrate, not spiral. Stamens diadelphous; anthers uniform. Ovary subsessile; ovules many; style filiform or thickened upwards, bearded down the inner face or penicillate at the apex; stigma terminal. Pod flat, linear or oblong, recurved.—Species 60. —Warm countries.

1. 2-4-seeded .... 2. D. *lablab.*
2. 5-6-seeded .... 1. *D. biflorus.*

D. lablab Linn. is used medicinally in China, Indo China, the Malay Peninsula, the West Indies, Gambia, and Egypt; *D. biflorus* Linn. in Madagascar; *D. falciformis* E. Mey., *D. gibbosus* Thunb., *D. lupiniflorus* N. E. Br. in South Africa.

OFFICIAL:—The hair from *D. pruriens* Linn.=*Mucuna pruriens* De Cand. and *D. urens* Linn.=*M. urens* De Cand. in Portugal.

1. **Dolichos biflorus** Linn. Sp. Pl. (1753) 727.—PLATE 327.

Annual. Branches suberect or twining, downy or glabrescent. Stipules oblong, basifixed. Leaflets 2.5-5 cm., broadly lanceolate or oblong, entire, membranous, downy; stipels subulate. Flowers 1-3, in the axils of the leaves; bracts lanceolate, one at the base of each pedicel and 2 placed laterally at the base of each flower. Calyx 6 mm., downy; teeth lanceolate-setaceous, much exceeding the tube. Corolla yellow, 1.3-2 cm. long; keel narrow, obtuse, rather shorter than the standard. Pods about 5 cm. long, scimitar-shaped, compressed, recurved, downy, tipped with the persistent style. Seeds 5-6, compressed, reniform, grey or reddish brown.

Distribution: Widely cultivated.

The seed is bitter, acrid, hot, dry; astringent to the bowels, fattening, antipyretic, anthelmintic; cures "kapha" and "vata", tumours, asthma, bronchitis, urinary discharges, hiccough, ozoena, abdominal complaints, heart troubles, diseases of the brain, intestinal colic, strangury, eye diseases, piles, leucoderma, inflammation, liver troubles, poisoning by mouth or by bites from animals; removes stones from the kidney; causes burning sensation (Ayurveda).

The seed is sweetish; diuretic, emmenagogue; increases appetite; removes stones from the kidney; cures hiccough, eye troubles, piles,

enlargement of the spleen, pain in the liver; improves the complexion; causes biliousness (Yunani).

The decoction is used in leucorrhœa and menstural derangements; it is also given to parturient women to promote the discharge of the lochia.

The globulins of Horse Gram have been isolated and analysed by Nuggihalli Narayana (*Journ. Ind. Inst. Sc.;* XIII (A), 1930).

Arabic: Habulkilat—; *Bengal:* Kurtikalai—; *Bombay:* Hulga, Kulte, Kulti—; *Canarese:* Hurali, Jurli—; *Central Provinces:* Kudki—; *Deccan:* Kulith, Kulthi—; *English:* Horse Gram, Kooltee, Madras Gram—; *Gujarat:* Kalathi, Kulit—; *Hindi:* Gahat, Kulthi—; *Konkani:* Kulid—; *Kumaon:* Gahat, Kalath, Kulthi, Kurthi—; *Malayalam:* Muthera—; *Marathi:* Kulith, Kulthi—; *Mundari:* Bororhore, Caulihore, Rutahore—; *Mysore:* Hurali—; *Nellore:* Vulava—; *Portuguese:* Colita, Culita—; *Punjab:* Bothungt, Gagli, Guar, Kalat, Kulath, Rawan, Roiong—; *Sanskrit:* Kalavrinta, Kulathika, Kulitha, Sitetara, Svetabija, Tamabija, Tamravriksha, Tamravrinta—; *Santal:* Horec—; *Sind:* Gagli, Kulitha—; *Sinhalese:* Kollu—; *Tamil:* Kollu—; *Telugu:* Wulavalli, Wulavulu, Uluva—; *Urdu:* Kulathi—.

2. **Dolichos lablab** Linn. Sp. Pl. (1753) 725.

A tall nearly glabrous twining perennial or annual, with round smooth or slightly downy stems. Leaves 10-30 cm. long; stipules 5 mm., basifixed, lanceolate; petiole 5-20 cm., glabrous; leaflets 5-15 cm. long, ovate, acute, entire, base cuneate or deltoid, pale green and glabrous or slightly pubescent beneath; stipels small, subulate, smooth; petiolules 5 mm., puberulous. Racemes 15-23 cm. long, lax, on peduncles 12.5-20 cm. long; pedicels fascicled on nodes 13-20 mm. apart; bracts caducous; bracteoles oblong. Calyx 13 mm.; teeth short, deltoid. Corolla white or pink, 15 mm. long. Pod 3.8-5 cm. long, tipped with the hooked persistent base of the style. Seeds 3-5.

Distribution: Tropics of the Old World.

The seed is sweet, acrid, dry, sourish; laxative, galactagogue, diuretic, anaphrodisiac, fattening, alexiteric; useful in inflammations;

harmful to eyesight; causes flatulence, burning sensations, diseases of the blood (Ayurveda).

In China, the seeds are said to be tonic and to relieve flatulence.

The leaves are a reputed alexipharmac in Indo China. They are also emmenagogue, and given in colic. The seeds are used as febrifuge, stomachic, and antispasmodic.

Assam: Uri, Urohi, Urshi—; *Batangas:* Bulai—; *Bengal:* Bhetarasu, Borboti, Bunshim, Ganchishim, Gheeasim, Gurdalshim, Lablab, Makhansim, Panchshim, Panchsim, Rajashimbi—; *Betsileo:* Makape—; *Bombay:* Pauti, Valapapadi, Valpapri—; *Burma:* Pai—; *Canarese:* Avare, Avre—; *Ceylon:* Bonavist Bean, Minni, Motchai, Tattapayaru—; *Chinese:* Pai Tou, Pien Tou—; *English:* Hyacinth Bean—; *French:* Haricot d' Egypte—; *Gujerati:* Oliya, Val—; *Hausa:* Wakenbaibayi, Wakendamfarni, Wakendarni, Wakengwari—; *Hindi:* Bhatavasu, Bhetarasu, Borboti, Lobia, Lobiya, Makhansim, Rajashimbi, Sim, Valm Wall—; *Indo China:* Bach bien dau, Dau bach bien, Dau van trang—; *Italian:* Fagiuolo d' Egitto—; *La Reunion:* Antaque, Pois Gervais, Pois Gerville—; *Malaya:* Pai Tou—; *Marathi:* Anvare, Kadavevala, Pandharepavate, Paote, Tambadepavade, Val—; *Mysore:* Bilimanavare, Manavare—; *Naga:* Kechu—; *North-West Provinces:* Chimi, Sem, Sembi, Shimi—; *Persian:* Lobiya—; *Punjab:* Kalalobia, Katjang—; *Sanskrit:* Nespava, Nishpava, Rajashimbi, Shimbi, Shvetashimbika, Simbi, Vallaka—; *Santali:* Malhan—; *Sind:* Wall—; *Sinhalese:* Hodhambala, Irivija—; *Spanish:* Habichuela de Egipto, Lablab—; *Tagalog:* Batao—; *Tamil:* Avarai, Motchai—; *Telugu:* Adavichikkudu, Alsanda, Anapachikkudu, Annapa, Anumulu, Boberlu, Tellachikkudu, Tellachikurkai—; *Trichinopoly:* Mochai—; *Visayan:* Batao—.

Rhynchosia Lour.

Herbs or undershrubs, twining or prostrate, rarely erect. Leaves pinnately (rarely digitately) 3-foliolate; stipules ovate or lanceolate. Leaflets dotted beneath with resinous glands, exstipellate or minutely stipellate. Flowers in axillary racemes, solitary or twin along the

rhachis, rarely solitary in the axils of the leaves; bracts caducous; bracteoles 0. Calyx-teeth not accrescent, the 2 upper more or less connate. Corolla included or exserted; standard obovate or orbicular with inflexed auricles at the base; wings narrow; keel incurved at the apex. Stamens diadelphous; anthers uniform. Ovary subsessile; ovules 2 (very rarely 1); style long, filiform, much incurved; stigma capitate. Pod round or oblong, compressed or turgid, usually continuous (rarely septate) within. Seeds 2 (rarely 1), the hilum parallel to the sutures and the funicle central upon it; strophiole thick, small, or 0.—Species 120.—Tropics and subtropics.

The genus has well-pronounced toxic properties.

R. volubilis Lour. is used medicinally in China; *R. calycina* Guill. and Perr. in the Gold Coast.

1. **Rhynchosia minima** DC. Prod. II (1825) 385.

A twining or trailing annual; stems numerous, slender, much-branched, pubescent when young. Leaves 3-foliolate; petioles 6-20 mm. long, more or less pubescent, striate; stipules 4 mm. long, linear-lanceolate. Leaflets 1-2.5 cm. long, as broad as long (the terminal sometimes broader than long), rhomboid-ovate or rhomboid-obovate, obtuse, apiculate, glabrous above, pubescent on the veins and conspicuously dotted beneath, base cuneate; stipels sometimes present, and when so, minute, subulate. Flowers in axillary 6-12-flowered lax racemes usually exceeding the leaves; pedicels very short. Calyx 3-4 mm. long, pubescent; teeth about twice as long as the tube, linear-subulate. Corolla yellow, 5-6 mm. long. Pods 13-16 by 6 mm., somewhat compressed, turgid, slightly recurved, glabrescent. Seeds 2 (very rarely one), compressed, 3 by 2 mm., black, estrophiolate.

Distribution: Throughout India, Ceylon.—Tropics generally, Cape, United States.

The leaves are sometimes used as an abortifacient.

Canarese: Ghattavare—; *Gujerati:* Nahanikamalavel—; *Machsar:* Waurwehri—; *Marathi:* Dhaktaranghevada—; *Nasirabad:* Waruvehri—; *Ormara:* Aeshak—; *Porebunder:* Jhinkidaliavel, Jhinkikamravel—; *Telugu:* Gadichikkudukaya, Nela alumu—.

Cajanus DC.

Species 1.—Tropical Africa and Asia.

C. indicus Spreng. is used medicinally in China, Indo China, Guiana, Brazil, and Madagascar.

1. **Cajanus indicus** Spreng. Syst. III, 248.—Plate 328 and 329.

An erect shrub, 1.5-3 m. high, with many sulcate silky branches. Leaflets oblong-lanceolate, acute, entire, densely silky beneath and indistinctly gland-dotted; stipules minute, soon falling. Flowers in loose corymbose racemes, or forming a terminal panicle; pedicels downy. Calyx 6 mm., gland-pubescent. Corolla three times the calyx; standard yellow, or (in C. bicolor) veined with red. Pod 5-7.5 cm. long, finely downy, often blotched with reddish purple streaks, tipped with the lower half of the style. Seeds about the size of a small pea, varying in colour from yellow and red to brown or black.

Distribution: Indigenous in S.-E. Asia.—Vastly cultivated in India.

The seed is acrid; astringent to the bowels, anthelmintic; restores lost taste; cures leprosy, "vata", and "kapha", ulcers of the mouth, tumours, bronchitis, vomiting, heart diseases, piles, cough, biliousness, "tridosha"; improves complexion; causes flatulence (Ayurveda).

The seeds have a good taste; indigestible; cause constipation, griping, biliousness, diarrhœa and weakness; alexiteric; improve the liver; lessen expectoration.—The leaves lessen inflammation; good in piles and for the teeth (Yunani).

The pulse and leaves are mixed and made into a paste which is warmed and then applied over the mammae to check the secretion of milk. A poultice made of the seeds will check swellings.

The pulse in combination with other drugs is recommended for the treatment of snake-bite (Charaka).

In Madagascar, the plant is considered bechic, diuretic, astringent, strongly antidysenteric, detergent, laxative, and vulnerant. The buds are pectoral; the flowers bechic; the juice of the leaves laxative; the flour from the seeds resolvent; the lye detergent.

In Guiana, the flour from the seeds is considered resolvent. The buds and the green pods are used in infusion as a pectoral. The boiled leaves are applied to wounds as a vulnerant; in decoction they are used as a detergent; the juice obtained by expression in the cold is used in hæmorrhage. An infusion of the flowers is considered pectoral.

The pulse is not an antidote to snake-venom (Mhaskar and Caius).

The proteins of the Pigeon Pea have been isolated and studied by Sundaram, Norris, and Subrahmanyan (*Journ. Ind. Inst. Sc.;* XII, (A) 1929).

Antsianaka: Antsotry—; *Arabic:* Shakhil, Shaz—; *Bengal:* Arhar, Crol, Oror—; *Betsileo:* Ambatry—; *Bombay:* Tura, Tuver—; *Burma:* Pai-si-song, Pay-in-chon, Pesigon—; *Canarese:* Adhaki, Dalu, Kariyudu, Togari, Turukutogari, Tuvari—; *Ceylon:* Paripu, Thovaroy—; *Central Provinces:* Tur—; *Chinese:* Shan Tou Ken—; *Deccan:* Tur, Tuvvar—; *English:* Cadjan Pea, Congo Bean, Congo Pea, Dal, Dhal, Dhol, No-Eye Pea, Pigeon Pea, Red Gram—; *French:* Ambarvaste, Ambervaste, Ambrevade, Ambrevale, Embrevade, Guandu, Pois d'Angole, Pois cajan, Pois cadjan, Pois du Congo, Pois nègre, Pois pigeon, Pois saint Cristophe, Pois de sept ans—; *French Guiana:* Pois d'Angole—; *Ga:* Blorfoyor, Yor—; *Gujarat:* Dangri, Tuer, Turdal, Tuvero—; *Hausa:* Waken Masar, Waken Stambul, Waken Turawa—; *Hindi:* Arardal, Arhardal, Tor, Tuvar—; *Hova:* Ambarivatry—; *Indo China:* Dau chieu, Dau sang, Sandek day, San dau can, Thua he—; *Kangra:* Dhingra, Kundi—; *Konkani:* Tori—; *Krepi:* Amdzimtua, Tiyi—; *La Reunion:* Ambrevade, Ambrevatte—; *Madagascar:* Amberivatry—; *Malayalam:* Adhaki, Kakshi, Tuvara—; *Marathi:* Tur, Turi—; *Mundari:* Rari—; *Nasirabad:* Arhar—; *North-Western Provinces:* Arhar, Dal, Rahan, Thohar, Thor, Thur—; *Oudh:* Arhar, Dal, Rahan, Tohar, Tor Tur—; *Persian:* Shakhil, Shakull—; *Philippines:* Cagyos—; *Portuguese:* Tantaraca, Tantaraga..; *Punjab:* Arhar, Dinger, Tohar—; *Sanskrit:* Adhaki, Kakshi, Karvirabhuja, Mritana, Mrittala, Mrittalaka, Pitapushpa, Shanapushpika, Supya,

Surashtaja, Tuvari, Tuvarika, Vritabija—; *Simla:* Kehu, Kohlu—; *Sinhalese:* Ratatora—; *Tagalog:* Cagnois—; *Tamil:* Adagam, Adagi, Iyavai, Paruppu, Tuvarai—; *Telugu:* Adhaki, Ettakandulu, Kandi, Kandulu, Kondakandi, Peddakandi, Peddakondakandi, Potukandi, Sinnakandi—; *Tulu:* Togari—; *Urdu:* Arhar—; *Uriya:* Horodo, Kandulo—; *Visayan:* Cadyos—.

ATYLOSIA Wight and Arn.

Herbs or shrubs, erect or twining. Leaves 3-foliolate, sometimes subdigitate, often exstipellate, gland-dotted beneath. Flowers axillary or racemed. Calyx-teeth distinct, longer or shorter than the tube, the lowest the longest. Corolla more or less exserted, marcescent or caducous, keel not beaked. Stamens 2-adelphous, anthers uniform. Ovary sessile; style filiform, incurved, glabrous; stigma capitate; ovules 3. Pod linear or oblong, turgid, marked with transverse lines between the seeds, which have a conspicuous divided strophiole.—Species 20.—Tropical Asia, Australia, Madagascar, Mascarenes.

The genus is therapeutically inert.

1. **Atylosia scarabaeoides** Benth. Pl. Jungh. 243.

A slender herbaceous twiner with densely grey-downy stems. Leaves 3.8-5 cm. long, subdigitately 3-foliolate; stipules minute, caducous. Leaflets obovate-oblong, obtuse or subacute, subcoriaceous, 3-nerved towards the base thinly grey-canescent above, pubescent and faintly reticulate-veined beneath, petiole 1.3 cm. long, brownish-pubescent; stipels 0. Racemes 2-6-flowered, on densely pubescent short axillary peduncles. Calyx densely grey-silky; teeth linear, the lowest twice as long as the tube. Corolla yellow, 8-10 mm. long; keel abruptly incurved at the tip. Pod straight, 2-2.5 cm. long, 4-6-seeded, clothed with fine spreading brown silky hairs, the transverse lines slightly oblique.

Distribution: Throughout India, up to 5,000 ft. on the W. Himalaya.—Malaya, China, Mauritius, Madagascar.

The plant is used for diarrhœa in cattle (Campbell).

La Reunion: Fausse pistache marronne—; *Mundari:* Birhore, Birjugihore, Bororhore, Tonangrahari—; *Sinhalese:* Walkollu—.

CYLISTA Ait.

A twining shrub. Leaves pinnately 3-foliolate. Leaflets stipellate, dotted beneath with resinous glands. Flowers in axillary sometimes panicled racemes; bracts membranous, hyaline, caducous; bracteoles 0. Calyx-tube campanulate; teeth obtuse, scarious, persistent, accrescent, the 2 upper connate into 1 emarginate tooth, the 2 lateral shorter, the lowest the largest, concave. Corolla enclosed in the calyx; standard suborbicular, with inflexed auricles at the base; wings narrow; keel incurved, obtuse. Stamens diadelphous; anthers uniform. Ovary subsessile; ovules 1-2; style filiform; stigma terminal. Pod small, oblique, oblong, enclosed in the calyx. Seed without a strophiole.—Species 4.—Palaeotropics.

The genus has little therapeutical value.

1. **Cylista scariosa** Roxb. Corom. Pl. I (1795) 64, t. 92.—PLATE 330.

A woody twiner; stems and branches finely downy. Leaves 3-foliolate; rhachis prolonged 6-13 mm. between the insertion of the lateral leaflets and the stipels of the terminal one; petioles 1.3-5 cm. long, downy; stipules 4-4.5 mm. long, triangular, acute, downy. Leaflets 5-10 by 3.8-5.7 cm. (the terminal rhomboid-ovate, the lateral slightly smaller, very obliquely ovate), acute, clothed with soft velvety pubescence above, densely downy and prominently reticulately veined beneath, base subcordate; petiolules 3 mm. long, densely downy; stipels 3 mm. long, subulate. Flowers in copious axillary peduncled racemes or panicles; pedicels very short, downy; bracts large, ovate, caducous. Calyx finely 2.5-3.2 cm. long; tube downy; lower lip 2 cm. broad, boat-shaped, conspicuously veined. Corolla yellow, concealed in the calyx. Pods small, oblique, downy, enclosed in the calyx, 1-seeded.

Distribution: Central Provinces, W. & S. India, Upper Burma.

The fruit of the yellow-flowered variety is acrid and bitter; improves taste; appetiser, astringent to the bowels, alexiteric; enriches the blood; cures biliousness and "kapha"; good for throat troubles; causes flatulence (Ayurveda).

The root is collected by the herbalists and sold as a remedy

for dysentery and leucorrhœa. It is also applied externally along with other drugs to reduce tumours. Its most remarkable property is astringency; reddish lucid juice issues from it when cut, which, on drying, becomes black and brittle, and may be seen adhering to the short pieces of the dry root which are offered for sale.

Canarese: Kadlenare—; *Cutch:* Khotivalor—; *Gujerati:* Kamalawel—; *Kathiawar:* Dariyawel—; *Marathi:* Ranghevada—; *Sanskrit:* Nadinishpava—; *Telugu:* Karuchikkudu—.

Flemingia Roxb. ex Ait.

Shrubs, rarely herbs. Leaves digitately 3-foliolate or simple, gland-dotted below. Inflorescence various; pedicels very short, not bracteolate. Calyx-tube short; teeth narrow, acuminate, the lowest often the longest. Corolla little or not exserted, petals equal in length, keel obutse or slightly rostrate. Stamens 2-adelphous, anthers uniform. Ovary subsessile, 2-ovuled; style filiform beardless, stigma capitate. Pod oblong, turgid, small, usually 2-seeded. Seeds not strophiolate, the funicle centrical.—Species 20.—Palaeotropics.

A. Shrubs. Leaves simple. Flowers in small cymes, each hidden by a large folded persistent bract		
1. Leaves oblong, subacute, broadly rounded at the base	1.	*F. strobilifera.*
2. Leaves rotund, cordate, cuspidate	2.	*F. chappar.*
B. Erect shrubs. Leaves digitately trifoliolate		
1. Leaflets obovate, obtuse or subacute	3.	*F. grahamiana.*
2. Leaflets oblong, acuminate, silky on the ribs below	4.	*F. congesta.*
3. Leaflets obtuse, plicate, reticulate, rugose beneath	6.	*F. nana.*
C. Trailing herbs with herbaceous roots. Leaves digitately trifoliolate. Bracts minute, caducous	5.	*F. tuberosa.*

The genus has little therapeutical importance.

1. **Flemingia strobilifera** R. Br. ex Ait. Hort. Kew. ed. 2, IV (1812) 350; Wight Ic. t. 267.—Plate 331A.

An erect much-branched shrub 1.2-3 m. high; branches slender, terete, pubescent towards the tips. Leaves 1-foliolate; petioles 0.6-2.5 cm. long, pubescent; stipules scarious, 6-8 mm. long, lanceolate, caducous. Leaflets subcoriaceous, minutely gland-dotted, 9-14 by 4-5 cm., ovate-oblong, acute, green and glabrous or nearly so above, paler and more or less silky-pubescent (especially on the

nerves) beneath, base rounded or truncate; main nerves 8-10 pairs, very conspicuous on the lower side; stipels 0. Flowers in axillary and terminal simple or branched racemes 7.5-15 cm. long, closely arranged along a slender pubescent zigzag rhachis; bracts large, membranous, persistent, glabrescent, broadly orbicular-ovate, shortly acuminate, 1.3-2.5 cm. long, usually broader than long, cordate at the base, conspicuously nerved and reticulately veined, stalked, each bract folded over and enclosing 2 or more small flowers. Calyx 6 mm. long, pubescent; teeth linear, acute, veined, longer than the tube. Corolla white, 1 cm. long; standard 8 mm. broad, auricled. Pods 10 by 5 mm., oblong, turgid, mucronate, densely pubescent, completely concealed by the bracts. Seeds 2 (rarely 1), dark brown, marbled.

Distribution: From Sind, Rajputana and Bengal to S. India and Ceylon, Burma, Andaman and Nicobar Islands, Malay Peninsula to Siam and Java.

The roots are used by the Santals in epilepsy (Campbell).

The Assamese take a small portion of the root in order to induce sleep and, it is said, even under great pain heavy sleep is brought on according to the quantity of the root taken. There are no ill effects (H. Brian, C. Hill, 1931).

Bombay: Nundar, Kanphuti—; *Burma:* Seluppya—; *Canarese:* Kumalu, Kumbilteri—; *Darjeeling:* Bolu—; *Malay:* Seringan—; *Malayalam:* Kumalu, Kumbilteri—; *Oudh:* Kasraut—; *Pegu:* Phatanphyu—; *Santal:* Simbusak—; *Sinhalese:* Hampinna—; *Telugu:* Nallabaddu—; *Visayan:* Gangan—.

2. **Flemingia chappar** Ham. in Wall. Cat. 5757.—PLATE 331B.

A shrub, 0.9-1.2 m. high, the branches terete, appressed tawny pubescent. Leaves 1-foliolate, cordate-orbicular, on a 3.8 cm. long petiole, shortly and rather abruptly acuminate, 5-7.5 cm. long and as broad or sometimes broader, 3 to almost 5-nerved at the base, indistinctly velvety above, minutely tawny pubescent beneath. Flowers small, yellowish, very shortly pedicelled, forming a small rusty pubescent cluster perfectly enclosed in the complicate large floral bracts and forming axillary and terminal large-bracted racemes. Bracts orbicular-reniform, retuse with a mucro, 1.3 cm. long, scarious

and nerved, glabrous. Calyx about 5 mm. long, puberulous, the lobes lanceolate, acuminate. Corolla glabrous, 8 mm. long.

Distribution: Bengal, Bihar, S. India, Burma.

The root is said to have the same properties as that of *F. strobilifera.*

Bengal: Salpan—; *Dehra Dun:* Chhanchra—; *Hindi:* Salpan—; *Oudh:* Kasraut—; *Uriya:* Boddhopholadhi, Singapornno—.

3. **Flemingia grahamiana** W. & A. Prodr. 242.—Plate 332.

A low erect shrub, with tomentose young shoots. Stipules lanceolate 6-8 mm., caducous; petiole 1.3-2.5 cm., erect-patent, not winged; leaflets subcoriaceous, 5-7.5 cm. long, plicate, glabrous above, grey-silky especially on the ribs beneath many of the veinlets raised. Spikes dense, oblong, 2.5-5 cm. long, often fascicled; bracts under 1.3 cm. long, erect-patent, subrigid, subpersistent. Calyx 1 cm.; teeth plumose, linear-setaceous, subequal. Corolla not exserted. Pod oblong, 1 cm. long, finely pubescent, and often covered with red viscous glands.

Distribution: Nilgiris.

The glands of the pod yield "waras", a purplish resinous powder somewhat similar to "kamala", and used as an anthelmintic in West Africa and Southern Arabia.

4. **Flemingia congesta** Roxb. Hort. Beng. (1814) 56.—Plate 333.

An erect shrub 0.6-0.9 m. high; young branches angular, sulcate, appressedly pubescent. Leaves 3-foliolate; petioles 4.5-7.5 cm. long with angular but not winged margins, pubescent. Leaflets 10-18 by 5-7 cm., subcoriaceous, ovate-oblong, acute (the terminal cuneate the lateral obliquely rounded at the base), dark green, glabrous or nearly so above, sparingly silky (especially on the nerves) beneath, strongly 3-nerved from the base; petiolules 3-6 mm. long, densely fulvous-pubescent. Flowers in dense axillary velvety congested racemes shorter than the petioles, the racemes sometimes solitary in the higher, usually fasciculate in the lower axils; pedicels very short, hairy; bracts lanceolate, 6 mm. long, densely velvety. Calyx 1 cm. long,

softly pilose, dotted with small black glands; tube distinct, teeth linear, acute, ciliate, much exceeding the tube, the lowest the longest. Corolla 11 mm. long; standard 4-5 mm. broad, white streaked with pink; wings purplish. Pods 3-13 by 6 mm., oblong, turgid, apiculate, finely pubescent, not glandular. Seeds 2.

Distribution: Throughout the hotter parts of India, Malay Peninsula.—Java.

The roots are used by the Santals as an external application to ulcers and swellings, mainly of the neck (Campbell).

Bengal: Barasalpan, Bhalia—; *Bombay:* Dowdowla—; *Burma:* Tha-kya-nai—; *Dun:* Banchhui—; *Hindi:* Barasalpan, Bhalia, Kusunt, Supta—; *Lepcha:* Mipitmuk—; *Malayalam:* Kamatteri—; *Marathi:* Dowdowla—; *Michi:* Dangshukop—; *Nepal:* Batwasi—; *Santal:* Birbut, Buru ekasira nari—; *Saora:* Kandranrogo—; *Uriya:* Bonokandulo—.

5. **Flemingia tuberosa** Dalz. in Kew Journ. Bot. II (1850) 34.

Perennial, prostrate; root tuberous, 5 cm. long, edible; stems 60-90 cm. long, copiously branched; branches terete, glabrous or with a few spreading hairs, faintly striate. Leaves 3-foliolate; petioles 2-3.8 cm. long, clothed with spreading hairs; stipules 3 mm. long, oblong, acute, caducous. Leaflets 3.2-5 by 1-1.1 cm., oblong-lanceolate, acute, sparsely hairy above, more strongly so on the nerves beneath, not or obscurely gland-dotted; midrib very conspicuous on the underside. Flowers in few-flowered lax axillary racemose cymes longer than the leaves, the branches very slender; bracts and bracteoles rigid, ovate, acute. Calyx 6-10 mm. long, densely hairy; teeth subequal, longer than the tube, linear, acute, strongly 3-nerved. Corolla lilac, slightly longer than the calyx; standard hairy on the back. Pods oblong, as long as or slightly exceeding the calyx, glabrous, transversely reticulate towards the apex. Seeds 1-2.

Distribution: Konkan.—Apparently endemic.

The tuber and roots are sweet, astringent; useful in dysentery and vaginal discharges (Ayurveda).

Marathi: Birmova—.

6. **Flemingia nana** Roxb. Hort. Beng. (1814) 56; Wight Ic. t. 389.

Suffruticose, 15-20 cm. high; stem scarcely any, about 2.5 cm. above ground, woody, perennial; branches few, short, subherbaceous. Leaves 3-foliolate; petioles 2.5-7.5 cm. long, winged; stipules 6-13 mm. long, linear-lanceolate, acute. Leaflets 2.5-7.5 by 2-4 cm. (the terminal obovate, narrowed, the lateral obliquely elliptic, rounded at the base), acute at the apex, more or less downy, 3-nerved; petiolules short; stipels 0. Flowers numerous, in axillary elongate slender racemes 7.5-10 cm. long, which are solitary or fasciculate, pedicels 3-4 mm. long, slender, pubescent and glandular; bracts 2.5 mm. long, lanceolate, caducous. Calyx 4 mm. long, pubescent and covered with ferruginous glands; teeth lanceolate, longer than the tube, the lowest the longest. Corolla 5 mm. long, greenish-pink with darker stripes. Pods 8-4 mm. long, oblong, turgid, clothed with a greenish grey tomentum and covered with viscid reddish glands. Seeds 2, round.

Distribution: Upper Gangetic Plain, Bihar, Chota Nagpur, N. Kanara.

The roots are used in ulcers and swellings.

Bengal: Barasalpan—; *Hindi:* Barasalpan—.

DALBERGIA Linn. f.

Trees or shrubs often climbing. Leaves alternate, imparipinnate or rarely 1-foliolate. Leaflets usually alternate, exstipellate. Flowers small, copious, in terminal or lateral panicles; bracts small subpersistent; bracteoles usually minute. Calyx campanulate; teeth short, distinct, the lowest usually the longest. Corolla exserted; standard broad; wings oblong; keel obtuse, its petals joined at the tip. Stamens 9-10, all connate into a tube split down the upper side, or the tube split into 2 equal bundles; anthers minute, basifixed, with the cells back to back, dehiscing usually by an apical (rarely a longitudinal) slit. Ovary stalked; ovules few; style incurved, short; stigma small, terminal. Pod oblong or strap-shaped, usually thin and flat, indehiscent, not thickened or winged at the sutures. Seeds 1-4, reniform, flat-compressed.—Species 120.—Warm countries.

A. Stamens 9, less commonly 10, monadelphous.
Staminal tube slit along the upper side only
I. Tall trees unarmed
a. Leaflets acuminate .... 1. *D. sissoo.*
b. Leaflets obtuse .... 7. *D. latifolia.*
II. Scandent shrubs
a. Leaflets 11-15 .... 2. *D. multiflora.*
b. Leaflets 25-41 .... 6. *D. tamarindifolia.*
B. Stamens 10. Staminal tube slit on the upper and lower sides
I. Trees
Standard 6 mm. broad with a callosity at the base of the limb .... 3. *D. lanceolaria.*
II. An erect shrub with spine-tipped branchlets .... 5. *D. spinosa.*
III. A climbing shrub. Leaflets 11-15 .... 4. *D. volubilis.*

D. hupeana Hce. is used medicinally in China; *D. tamarindifolia* Roxb. in Indo China; *D. obovata* E. Mey. in South Africa.

1. **Dalbergia sissoo** Roxb. Hort. Beng. (1814) 53.—PLATE 334.

A tree reaching 18 m. high; young parts pubescent or tomentose; branches numerous, spreading. Leaves alternate, bifarious, imparipinnate; leaf-rhachis zigzag; petioles terete, very downy when young; stipules lanceolate, caducous. Leaflets 3-5, firm, 3.8-6.3 by 3-5.4 cm. (the terminal the largest and the lowest the smallest), distant, alternate, suborbicular, conspicuously and abruptly acuminate, puberulous when young, soon glabrescent, base narrowed or cuneate; petiolules 3-6 mm. long. Flowers sessile or nearly so, in axillary panicles shorter than the leaves and composed of several short subsecund spikes; rhachis and branches of the panicle densely hairy; bracts linear-subulate hairy. Calyx 4-5 mm. long, hairy; teeth short, ciliate, the 2 upper connate except at the tip, the lateral linear, obtuse, the lowest the longest, subacute. Corolla pale yellow, 6-8 mm. long; standard 4 mm. broad, with a long claw, the limb obovate-orbicular. Stamens 9 in one bundle, the sheath of the filaments slit only at the top. Ovary pubescent; ovules 2-4. Pods 3.8-10 by 0.6-1.3 cm. narrowed at the base into a long stalk which is twice as long as the calyx, thin, strap-shaped, glabrous, slightly reticulate. Seeds 1-4.

Distribution: Baluchistan, Waziristan, W. Himalaya up to 4,000 ft., Terai of Nepal and Sikkim to Upper Assam; extensively planted throughout India.

The bark and wood are bitter, hot, acrid; aphrodisiac; abortifacient, expectorant, anthelmintic, antipyretic, appetiser;

allays thirst, vomiting, burning sensation; cures skin diseases, troubles of the anus, ulcers, diseases of the blood, leucoderma, dyspepsia, dysentery.—The juice of the leaves is good for diseases of the eye (Ayurveda).

The wood is bitter with a bad taste, anthelmintic; enriches the blood; good for diseases of the eye and of the nose; used in scabies, burning sensation of the body, scalding urine, syphilis, stomach troubles (Yunani).

The roots are said to be so astringent that they are neither eaten by rats nor ants. The oil is applied externally in cutaneous affections.

The mucilage of the leaves mixed with sweet-oil is a good application in excoriations. A decoction of the leaves is given in the acute stage of gonorrhœa.

The wood is considered alterative; useful in leprosy, boils, eruptions, and to allay vomiting.

Arabic: Sasam, Sasim—; *Assam:* Sissu—; *Bannu:* Shawa, Shewa—; *Bengal:* Shisu, Sisu—; *Bombay:* Sissu—; *Canarese:* Agaru, Biridi, Birade, Ibadi, Irukuntimavu, Simsape, Sishmabage—; *English:* South Indian Redwood, Sissoo—; *French:* Bois de palissandre—; *Gujerati:* Sissom, Tanach—; *Hindi:* Shisham, Sisam, Sissai, Sissu, Sisu—; *Jhalawan:* Jag—; *Konkani:* Sisso, Sissu—; *Kotra:* Tahli—; *Kumaon:* Shisham—; *Lepcha:* Tukreekung—; *Malayalam:* Iruvil—; *Merwara:* Shisham—; *Nasirabad:* Tali, Zagha—; *Nepal:* Sissau—; *North-Western Provinces:* Sisu—; *Oudh:* Sissai—; *Peshawar:* Shawa, Shewa—; *Portuguese:* Pau preto, Pau sisso—; *Punjab:* Nelkar, Shewa, Shia, Shin, Shishai, Shisham, Tali—; *Pushtu:* Zagar—; *Rajputana:* Shisham—; *Sanskrit:* Aguru, Agurushinshupa, Dhira, Dhumrika, Kalanusarya, Kapila, Krishnasara, Mandalapatri, Pichhila, Pipala, Shinshapa, Shyama, Tivradhumaka, Vira, Yugapatrika—; *Shahrig:* Tali, Zaghah—; *Sibi:* Tali, Zagha—; *Sind:* Sissu, Tali—; *Tamil:* Gette, Itti, Nukku, Pichai, Sisu, Yette—; *Telugu:* Ettasissu, Sinsupa, Sissu—; *Urdu:* Shisham—; *Uriya:* Sisu—.

2. **Dalbergia multiflora** Heyne ex Wall. Cat. sub no. 5848.

—*D. sympathetica* Nimmo ex Grah. Cat. Bomb. Pl. (1839) 55.—PLATE 335 (under *D. sympathetica*).

A large scandent shrub running over high trees; branches often twisted, the young ones pubescent; trunk armed with strong blunt often fantastically curved clustered spines 15-25 cm. long. Leaves 10-15 cm. long; rhachis softly pubescent. Leaflets 11-15, moderately firm, 1.3-3 by 0.6-2 cm., oblong, obtuse, emarginate (the terminal obovate, cuneate), softly pubescent on both surfaces, reticulately veined; petiolules 1.25 mm. long. Flowers numerous, in dense short axillary cymose panicles, with rusty-pubescent corymbose branches; pedicels very short; bracts and bracteoles minute, oblong, obtuse. Calyx 3 mm. long, pubescent; teeth about equalling the tube, the 2 upper broad, obtuse, the 2 lateral smaller and narrower, subacute, the lowest the longest, lanceolate, acute. Corolla 5 mm. long; standard 3 mm. broad, obovate-oblong, emarginate, without any callosity at the base, the claw shorter than the tube of the calyx. Stamens 10 in one bundle. Ovary pubescent. Pods when 1-seeded 3.8-5 by 1.6-2 cm., when (less commonly) 2-seeded reaching 7.5 by 2.5 cm., narrowed to the point and at the base into a very short stalk, glabrescent, reticulate. Seeds 1-2.

Distribution: Hills of the W. Peninsula.

In Goa, the bark is used as a " lep " to remove pimples. The leaves are used as an alterative.

Bombay: Pentagul—; *Canarese:* Muldi—; *Goa:* Titabli—; *Marathi:* Pentgul, Petaguli, Titavali, Yakayela—.

3. **Dalbergia lanceolaria** Linn. f. Suppl. Pl. (1781) 316.—PLATE 337.

A large tree 9-12 m. high; bark grey. Leaves 7.5-18 cm. long; stipules minute, caducous. Leaflets 2-3.8 by 1-2 cm., elliptic or oblong, obtuse, emarginate, glabrous above, pale and more or less puberulous beneath, base rounded or subacute; main nerves very oblique, numerous, parallel, conspicuous; petiolules 3-5 mm. long. Flowers in copious axillary and terminal leafless panicles clothed with rufous pubescence; pedicels 2 mm. long, rufous-hairy; bracts and bracteoles minute, caducous. Calyx 5 mm. long, silky-hairy;

teeth half as long as the tube, ciliate, the 2 upper obtuse, the 2 lateral equalling the upper, subacute, the lowest the longest, linear-lanceolate, acute. Corolla 1 cm. long; standard broadly obovate, 6 mm. broad, with a large callosity above the claw. Stamens in 2 bundles of 5 each. Ovary stalked, usually hairy at the base; ovules 3. Pods 1.3-2 cm. broad and when 1-seeded 3.8-5 cm. long (when 2-seeded sometimes reaching 10 cm. long), thin, flexible, narrowed to the point and gradually at the base into a long stalk, glabrous or nearly so, reticulately veined.

Distribution: Throughout India, Ceylon.

The Santals use the bark along with that of *Flacourtia Ramontchi* as an external application during intermittent fever. The leaves and the roots are also employed medicinally (Campbell).

In Southern India, the bark, and an oil obtained from the seeds are used medicinally. The bark in infusion is given internally in dyspepsia; the oil is used in rheumatic affections.

Banswara: Barbat, Parbati—; *Bengal:* Chakemdia—; *Bombay:* Gengri, Harrani, Takoli—; *Canarese:* Belaga, Betta-hasarugoni, Hasarugoni, Kanaga, Manjalabite—; *Ceylon:* Velurruvai—; *Dharwar:* Harrani—; *Gujarat:* Tantosi—; *Hindi:* Bithua, Takoli—; *Kolami:* Piri—; *Malayalam:* Mannavitti, Pulari, Punnu—; *Marathi:* Dandoshi, Dandus, Dandusa, Kaurchi—; *Merwara:* Passi—; *Mundari:* Birmunga, Keadcadlom-daru—; *Nepal:* Bander siris—; *North-Western Provinces:* Bithua, Takoli—; *Panch Mahals:* Gengri—; *Puri:* Chakemdia—; *Rajputana:* Passi—; *Santal:* Chapot siris—; *Sind:* Dandous—; *Sinhalese:* Belulabba—; *Tagalog:* Macapil—; *Tamil:* Erigai, Kalvellangu, Kattuppachalai, Nalvellange—; *Telugu:* Ettapachari, Kondapachari, Nagulapachari, Pachari, Pasaruganaru, Peddapachari, Peddasapara, Potupachari, Tellavirugudu, Vellari—; *Thana:* Dandashi—; *Uriya:* Dodilo.—.

4. **Dalbergia volubilis** Roxb. Corom. Pl. II (1798) 48, t. 191.—Plate 336.

A large woody climber reaching 12-15 m. high; branches glabrescent, thickened in places and twisted into spiral hooks. Leaves 10-15 cm. long; rhachis pubescent. Leaflets 11-13, thickly

coriaceous, 2.5-5 by 2-2.5 cm. (the terminal the largest), oblong or obovate-oblong, obtuse or truncate, sometimes emarginate, apiculate, dark green above, paler beneath, glabrous; petiolules 3 mm. long, glabrous. Flowers in copious axillary and terminal leafless panicles 20-30 cm. long, with numerous lateral branches 2.5-7.5 cm. long, bearing dense corymbose cymes; pedicels very short; bracts at the base of the panicle small, ovate, subpersistent, those at the base of the pedicels 1.5 mm. long, oblong, obtuse, pubescent on both sides, ciliolate; bracteoles beneath the calyx 2, oblong-obtuse, 1.5 mm. long, pubescent on both sides, ciliolate. Calyx 3 mm. long, densely puberulous; teeth about one-third the length of the tube, the 4 upper oblong, obtuse, the lower longer, triangular, subacute. Corolla 5-6.5 mm. long, pale blue; standard 4 mm. broad, suborbicular-oblong. Stamens 10, in 2 bundles of 5 each. Pods 5-7.5 by 2-2.5 cm., stalked, linear-oblong, obtuse, conspicuously veined, glabrous. Seeds 1-2.

Distribution: India generally.

In the Konkan, the juice of the leaves is applied to aphthæ, and used as a gargle in sore-throat. The root-juice, with cumin and sugar is given in gonorrhœa.

Burma: Dauktalaung—; *Hindi:* Bankhara, Bhatia—; *Khond:* Bamba—; *Kumaon:* Bhatia—; *Malayalam:* Mryti, Rongdi—; *Marathi:* Alai, Alei—; *Santal:* Bir munga, Nari siris—; *Tamil:* Punali—; *Telugu:* Baddugaruttuginja, Gavileputige, Kotipachara—; *Uriya:* Nuanbadi, Sorumadhugoli—.

5. **Dalbergia spinosa** Roxb. Fl. Ind. III (1832) 233.—Plate 338.

A large shrub with a tendency to climb, the branches usually armed with long straight or hook-like twisted often spiny sterile branchlets, all parts glabrous. Leaves unpaired-pinnate, 2.5-5 cm. long. the rhachis filiform. Leaflets in 3-5 pairs, alternate, obversely oval, blunt or notched, on a slender 1 mm. long petiolule, about 1.3 cm. long, entire, membranous, glabrous, glaucous-green, turning brownish in drying. Flowers small, white, with a yellowish standard, on capillary about 1-2 mm. long pedicels, forming a simple or branched axillary raceme shorter than the leaves, the rhachis

filiform. Calyx about 2 mm. deep, glabrous, the teeth long, blunt, the lowermost more than doubly longer than the others. Corolla glabrous, about 3 mm. long, the petals shortly clawed. Stamens 10, in a single slit sheath. Anthers 4-celled, the cells globular. Ovary glabrous. Pod compressed, reniform, 1.6-2.5 cm. long, blunt with a mucro, at the base contracted in a 6 mm. slender stalk, almost smooth and glabrous, coriaceous, 1-seeded.

Distribution: Shores of the E. and W. Peninsulas, Chittagong.

A spoonful of powdered roots in a tumblerful of water is said to be sufficient to destroy, in less than half an hour, the effects of alcohol, even in cases bordering on delirium tremens (Kurz).

Burma: Yechinya—; *Telugu:* Chillanki—; *Visayan:* Balibagan—.

6. **Dalbergia tamarindifolia** Roxb. Hort. Beng. (1814) 53.

A scandent shrub 4.5-12 m.; young branches densely rufous-pubescent. Leaves 10-15 cm. long; rhachis densely puberulous; stipules lanceolate, 5 mm. long. Leaflets 25-41, moderately firm, caducous, 10-20 by 4.5-10 mm., trapezoid-oblong, truncate, rounded, sometimes emarginate at the apex, thinly pubescent on both surfaces, paler beneath; petioles very short. Flowers in congested sessile corymbosely branched axillary panicles 2-5 cm. long, the branches of the panicle densely brown-pubescent; pedicels 1.6 mm. long; bracts 1.6 mm. long, ovate, subacute, pubescent, persistent; bracteoles 2 mm. long, broadly oblong, obtuse, pubescent, persistent. Calyx 4 mm. long, glabrous; teeth one-third as long as the tube, short, subequal, subobtuse. Corolla 10 mm. long, white; standard 2.5 mm. broad, not thickened above the claw which is as long as the tube of the calyx. Stamens usually 9 (rarely 10), monadelphous. Ovary glabrous; ovules 2-3. Pods 3.8-7.5 by 0.8-1.3 cm., thin, greenish, drying bright reddish brown, strap-shaped, glabrous, shining, slightly reticulate.

Distribution: Himalayas from Nepal eastwards, W. Peninsula.—Indo-China, Malaya.

The root is used in Indo China as a masticatory and an anthelmintic.

Indo China: Cham bia an trau—; *Nepal:* Damar—; *Sylhet:* Keti—.

7. **Dalbergia latifolia** Roxb. Corom. Pl. II (1798) 7, t. 113; Wight Ic. t. 1156.—*D. emarginata* Roxb. Hort. Beng. 53.

A large glabrous tree reaching 24 m. high; branches numerous, spreading, forming a shady head. Leaves imparipinnate, 10-15 cm. long; rhachis straight, glabrous, much produced beyond the insertion of the uppermost pair of leaflets. Leaflets 5-7 (usually 5), firm, 3.2-6.3 cm. long, nearly as broad as long (the terminal slightly the largest), broadly ovate or suborbicular, rounded, sometimes emarginate at the apex, glabrous on both sides, pale beneath, base shortly cuneate; petiolules 6-8 mm. long. Flowers in axillary or extra-axillary lax divaricate panicles usually shorter than the leaves; pedicels 1.6-3 mm. long, filiform; bracts minute; bracteoles membranous, very caducous. Calyx 3-5 mm. long, glabrous; teeth linear-oblong, obtuse, rather shorter than the tube. Corolla 6 mm. long, greenish or yellowish white, the petals with long claws. Stamens 9 in 1 bundle. Ovary glabrous; ovules 3-5. Pods 3.8-7.5 by 1.3-2 cm., strap-shaped, slightly reticulated, glabrous. Seeds 1-3 (rarely 4).

Distribution: Oudh, E. Bengal, Bihar, Sikkim, Bundelkhand, Central India, W. Peninsula.

The plant is a bitter tonic and stomachic. It is used in leprosy, obesity, and worms.

Bengal: Sitsal, Swetasal—; *Bhil:* Bhotuk—; *Bombay:* Kalaruk, Shisar, Shissam, Sissu, Tivas—; *Canarese:* Bite, Ibadi, Todagatti—; *Central Provinces:* Shisham, Siras—; *English:* Blackwood of Southern India, Bombay Blackwood, Bombay Rosewood, Dark Blackwood, Malabar Blackwood—; *Gond:* Seris—; *Gujerati:* Shisam, Sisam, Sissu—; *Hindi:* Shisham, Shisu, Walayti shisham—; *Kolami:* Kiri, Ruti, Siso—; *Konkani:* Shisao—; *Kurku:* Serisso—; *Lambadi:* Shushmaru—; *Malayalam:* Cholavitti, Itti, Karitti, Karvitti, Ulnalavitti, Vitti—; *Mandla:* Siras, Sirsa, Sissu—; *Marathi:* Bhotheula, Kalarukh, Shisham, Shisu, Sissui,, Sisu, Sisva, Siswa—; *Merwara:* Shisham—; *Michi:* Ruzerap—; *Mundari:* Kiridaru—; *Nepal:* Satisal—; *Oudh:* Sitsal—; *Punjab:* Shisham—; *Rajputana:* Shisham—; *Sanskrit:* Shishapa—; *Santali:* Satsaiyar—; *Saora:* Iridi,

Irugudi—; *Sind:* Tali—; *Tamil:* Itti, Karundorviral, Nukku, Todagatti—; *Telugu:* Chittegi, Irugudu, Iruvudu, Jitangi, Jitregi; Jittegi, Virugadu, Yerugudu—; *Tulu:* Biti—; *Uriya:* Sissa, Sissua—.

PTEROCARPUS Linn.

Erect unarmed trees. Leaves alternate, imparipinnate. Leaflets usually alternate, exstipellate. Flowers generally yellow, in axillary and terminal racemes or panicles; bracts and bracteoles small, caducous. Calyx turbinate, usually curved before expansion teeth short. Corolla exserted, the petals with long claws glabrous; standard orbicular or boardly ovate; keel-petals free or slightly cohering. Staminal tube slit both above and below or above only, the vexillary stamen often nearly or quite free; anthers versatile. Ovary sessile or stalked; ovules 2-6; style filiform, slightly incurved; stigma small, terminal. Pod orbicular or broadly ovate, with a broad rigid wing, the point turned down to opposite the base or near it. Seed 1 (rarely 2), oblong or subreniform; radicle short, incurved. —Species 24.—Tropics.

1. Leaflets 3 .... 1. *P. santalinus.*
2. Leaflets 5-7 .... 3. *P. marsupium.*
3. Leaflets 7-11 .... 2. *P. indicus.*

The genus is well known for the astringent properties of the wood and gum.

The following species are used medicinally in China—*P. santalinus* Linn. fil.—; in Indo China—*P. cambodianus* Pierre, *P. indicus* Willd., *P. pedatus* Pierre—; in the Philippine Islands—*P. erinaceus* Lam., *P. indicus* Willd., *P. santalinus* Linn. fil.—; in Venezuela—*P. draco* Linn.—; in Gambia and Nigeria—*P. erinaceus* Lam.—; in Guinea—*P. erinaceus* Lam., *P. indicus* Willd.—; in South Africa—*P. angolensis* DC.

OFFICIAL:—The gum resin of *P. Draco* Linn.=*P. officinalis* Jacq. (Portugal); *P. Marsupium* Roxb. (Portugal, Switzerland, United States).

The heart-wood of *P. indicus* Willd.=*P. Draco* Lam. non Linn. (Portugal); *P. santalinus* Linn. fil. (Austria, Sweden, United States),—Linn. (Holland).

1. **Pterocarpus santalinus** Linn. f. Suppl. 318; Bedd. Fl. Sylv. t. 22.—PLATE 339.

A small tree, attaining 7.5 m., with extremely hard, dark purple heart-wood. Leaflets 3 rarely 4 or 5, broad-elliptic, obtuse, 3.8-7.5 cm. long, underside pale and clothed with fine adpressed hairs. Flowers few, in short axillary or terminal racemes. Pod 3.8 cm. diam., oblique, gradually narrowed into a short stalk.

Distribution: Deccan, in the hills of Cuddapah, S. Kurnool, N. Arcot and Chingleput, up to 1,500 ft.

The wood is bitter with a flavour; very cooling; antipyretic, anthelmintic, tonic, aphrodisiac, alexiteric; useful in vomiting, thirst, eye diseases; cures diseases of the blood, "vata" and "kapha", biliousness, mental aberrations, ulcers (Ayurveda).

The wood is bitter with a bad taste; inferior to white sandalwood; good for topical application only; if given by mouth causes coughing with expectoration; useful in fever, inflammation, troubles of the head and neck, toothache; cures hemicrania.—The seeds stop hæmorrhage of the urethra; useful in dysentery (Yunani).

Red sandalwood is considered astringent, tonic, and is used as a cooling external application for inflammation and headache. It is a hot remedy, useful in bilious affections and skin diseases, also in fever, boils, and to strengthen the sight. It also acts as a diaphoretic, and is applied to the forehead in headache.

The wood, rubbed up with water, is advantageously employed as a wash in superficial excoriation of the genital organs .

Used also over swelling of eyelids for reducing the swelling.

A decoction of the legume is useful as an astringent tonic in chronic dysentery, after separation of the slough.

The wood in combination with other drugs is prescribed for the treatment of snake-bite (Sushruta, Sharangdharasamhita) and scorpion-sting (Sushruta).

The wood is not an antidote to snake-venom (Mhaskar and Caius) or scorpion-venom (Caius and Mhaskar).

Arabic: Sandaleahmar, Sandulhamra, Undum—; *Bengal:* Kuchunduana, Lal chandan, Rakta chandana, Raktachondon, Ranjana, Ruktchundun, Tilaparni—; *Bombay:* Lalachandana,

Raktachandan, Ratanjli—; *Burma:* Nasani, Sandaku—; *Canarese:* Kempugandha, Patranga, Raktashandana—; *Chinese:* T'an Hsiang—; *Danish:* Sandelhout—; *Deccan:* Lalchandan, Undum—; *English:* Red Sandal Wood, Red Sanders, Ruby Wood, Sanders Red—; *French:* Bois caliatour, Santal rouge—; *German:* Rotes sandelholz—; *Gujerati:* Ratanjli—; *Hindi:* Lalchandan, Ragat chandan, Rukhto chandan, Undum—; *Italian:* Sandalo roso—; *Konkani:* Raktachandan—; *Malayalam:* Patrangam, Raktashandanam, Senshendanam, Tilaparnni, Uruttushandanam—; *Marathi:* Raktachandan, Tambadachandana—; *Pampangan:* Apalit, Daytanag—; *Persian:* Buckum, Dulsurkh, Sandalesurkh, Sandulsurkh, Sun, Undum—; *Portuguese:* Sandalo vermelho—; *Punjab:* Chandanlal—; *Sanskrit:* Agarugandha, Arka, Bhaskarpriya, Chandana, Harichandana, Kshudrachandana, Kuchandana, Kumoda, Kushikam, Lohita, Lohitachandana, Malayaja, Patranga, Pattanga, Pravalphala, Raktabija, Raktachandana, Raktakta, Raktanga, Raktasara, Ranjana, Tamrabhra, Tamrasara, Tamravriksha, Tilaparni—; *Sinhalese:* Rat-handun, Ructhandun—; *Tagalog:* Naga, Narra—; *Tamil:* Atti, Kusandanam, Picanam, Pidagattam, Salliyam, Sandanam, Sandanavengai, Sensandanakkattai, Sensandanam, Sivappuchandanam—; *Telugu:* Agarugandhamu, Ettachandamu, Kuchandanamu, Raktachandanamu, Raktagandhamu, Shandanamu—; *Tulu:* Benne—; *Uriya:* Indrochondono, Lohotichondono, Roktochondono—.

2. **Pterocarpus indicus** Willd. Sp. Pl. III, 904.

Tree, 18-24 m. or more. Stem 1.2-1.5 m. through. Leaves 20-25 cm. long; leaflets 5-9, ovate, base rounded or short cuneate acuminate, 5-10 cm. long, 3.8-5 cm. wide, terminal a little larger. Panicles 15 cm. long. Calyx 6 mm. long, brown silky. Corolla golden yellow, 1.5 cm. long. Pod 4.5-5 cm. across, pubescent.

Distribution: Malay Peninsula, Tenasserim.—Malay Islands, Java, Borneo.

The kernel of the fruit is emetic.

In Guinea, a light infusion of the leaves is given in fevers; but it is mostly used in the forms of lotion and fumigation.

The wood is much used in Cambodia for its antithermic and antipaludian properties. It is also considered diuretic and anti-dysenteric.

Andamans: Chalangada—; *Burma:* Padauk, Toungkhayai—; *Cambodia:* Chan Kraham—; *Canarese:* Honne—; *English:* Andaman Redwood, Malay Padauk, Padauk—; *Fulah:* Diegou—; *Malaya:* Angsana—; *Malinke:* Diahon, Diegou—; *Pampangan:* Daitanag—; *Philippines:* Agana, Antagan—; *Soussou:* Khembe—; *Tagalog:* Asana, Narra—; *Tamil:* Vengai—; *Telugu:* Ettavegisa, Gandamrigapunetturu, Simagandamrigapunetturu—; *Visayan:* Naga, Narra—.

3. **Pterocarpus marsupium** Roxb. Corom. Pl. II (1798) 9, t. 116; Bedd. Fl. Sylv. t. 21.—Plate 340.

A large deciduous tree with a stout crooked stem and widely spreading branches; bark thick, yellowish grey, the outer layer corky. Leaves 15-23 cm. long; rhachis glabrous, prolonged 2-2.5 cm. beyond the insertion of the upper lateral leaflet. Leaflets 5-7, coriaceous, 6.3-10 by 3.8-5 cm., oblong, obtuse, rounded, truncate or more or less retuse at the apex, glabrous on both surfaces, shining above, base subacute; main nerves numerous, close prominent; petiolules 6-10 mm. long. Flowers in short lateral and terminal fusco-pubescent paniculate racemes, usually shorter than the leaves; pedicels short, articulated beneath the flower. Calyx 6 mm. long, veined, brown-pubescent; teeth very short, broadly triangular, the upper the largest. Corolla 1.3 cm. long, pale yellow, with crisp margins; standard 11 mm. broad, with a long claw. Stamens monadelphous or the staminal tube often finally slit on both sides making them isadelphous. Ovary shortly stalked; ovules 2. Pods 2.5-5 cm. diam., nearly circular, glabrous or nearly so, the wings veined. Seed small.

Distribution: W. Peninsula and S. India, Ceylon.

The plant and the gum are hot and bitter with a sharp taste; laxative, anthelmintic, alterative; cure "vata" and "kapha", diseases of the blood, eruptions on the body, leucoderma, erysipelas, urinary discharges, anal troubles, leprosy; useful in eye troubles

and elephantiasis.—The flowers are sweet, bitter; improve the appetite; cause flatulence (Ayurveda).

The gum is bitter with a bad taste; useful in all diseases of the body; styptic, vulnerant, tonic to the liver, antipyretic, anthelmintic; good for griping and biliousness, ophthalmia, boils, gleet and urinary discharges (Yunani).

The gum is used for toothache on the Coromandel Coast. It is a good astringent in diarrhœa and pyrosis.

In Goa, the bark of the tree is used as an astringent.

The bruised leaves are useful as an external application to boils, sores, and skin diseases (Rumphius).

Almora: Bipasal—; *Arabic:* Dammulakvainehindi, Damulakhvain—; *Bengal:* Pitsal, Pitshul, Piyashal—; *Bhil:* Radatbera—; *Bijeraghogarh:* Bijaira—; *Bombay:* Asan, Bibala, Bibla, Bija, Dorbenla, Honi, Honne, Huni, Piasal—; *Canarese:* Benga, Bibla, Honne, Netturuhonne, Olehonne, Roktahonne—; *Central Provinces:* Bia, Bijasah, Bijasal, Dhorbenla—; *Coorg:* Bange, Raktahonne—; *Deccan:* Bia, Bibla, Bewba—; *English:* Indian Kino Tree, Malabar Kino Tree—; *French:* Kino des Indes, Ptérocarpe ă bourse—; *Gond:* Bijo, Peddei—; *Gujerati:* Bia, Bibla, Bio, Hiradakhana—; *Haldwani:* Bijesal—; *Hindi:* Banda, Bija, Bijasal, Bijasar, Biya, Hiradokhi, Peisar, Piasal, Pitshola—; *Khond:* Vengis—; *Kolami:* Hed, Hid, Hilum, Hitun, Paisar—; *Konkani:* Assan, Asson—; *Lambadi:* Bhiyero—; *Malayalam:* Karintakara, Malantakara, Venna—; *Marathi:* Asan, Asana, Bibla, Dhorbenla, Honi, Huni—; *Mundari:* Hid daru—; *Persian:* Khunesiahwasham—; *Sanskrit:* Asana, Bandhukapushpa, Bijaka, Bijavriksha, Mahakutaja, Mahasarja, Nilaka, Pitasalaka, Pitasara, Pitashala, Paramayudha, Priyaka, Priyasalaka, Sauri—; *Santal:* Banda, Murga—; *Saora:* Kondavegisa, Vengisa—; *Sinhalese:* Ganmalu, Gummalu—; *Tamil:* Asanam, Kani, Kurinji, Pidasaralam, Pirasaram, Pidagaragam, Sarvasadagam, Sarudagam, Tamisu, Tannini, Timisam, Timil, Timisu, Udiravengai, Vandunarmalar, Vengai, Visaga—; *Telugu:* Peddagi, Peddavegisa, Peddegi, Pedegu, Vegisa, Vengisa, Yegi—; *Urdu:* Damulakhvain—; *Uriya:* Piyasalo—.

PONGAMIA Vent.

Species 1.—Indo-Malayan.

P. glabra Vent. is used medicinally in China, Indo China, the Philippine Islands, Australia, and La Reunion.

1. **Pongamia glabra** Vent. Jard. Malm. (1803) 28; Wight Ic. t. 59.—PLATE 341.

A tree. Leaves alternate, imparipinnate; leaflets opposite; stipules small; stipels 0. Flowers in lax axillary racemes, the flowers in fascicles of 2-4 on the rhachis; bracts small caducous; bracteoles minute. Calyx campanulate, truncate; teeth obsolete. Corolla much exserted; standard suborbicular with curved folds above the claw; wings obliquely oblong, slightly adnate above the claws to the obtuse keel-petals which are joined near the tip. Stamens 10 monadelphous, the vexillary stamen free below and above; anthers uniform. Ovary subsessile; ovules 2; style incurved, beardless; stigma capitate. Pod obliquely oblong, attenuated at both ends, curved at apex, thick, more or less compressed, indehiscent. Seed 1, reniform, rather thick; hilum small.

The root and bark are hot, bitter, acrid; anthelmintic, alexipharmic; useful in diseases of the eye, the vagina, the skin; good for tumours, piles, wounds, ulcers, itching, ascites, enlargements of the spleen and the abdomen, urinary discharges; cure biliousness, "vata" and "kapha".—The sprouts are stomachic, alexiteric, anthelmintic; improve the appetite; cure "kapha", "vata", piles, skin diseases, inflammation.—The leaves are hot, digestive, laxative, anthelmintic; cure "kapha", "vata", piles, wounds, inflammations; cause biliousness.—The flowers cure "vata" and "kapha", biliousness, diabetes.—The fruit and the seed are hot; anthelmintic; cure diseases of the head, the brain, the eye, the skin; useful in keratitis; cure "kapha", "vata", piles, urinary discharges.—The oil is hot, anthelmintic; cures eye diseases, pains due to rheumatism, leucoderma, itching, wounds, skin diseases; causes biliousness and "raktapitta" (Ayurveda).

The seed is bitter and acrid; carminative; purifies and enriches the blood; relieves inflammation; cures earache, lumbago, chest complaints, chronic fevers, hydrocele.—The oil is styptic, anthelmintic;

good in scabies, leprosy, piles, ulcers, lumbago, chronic fevers, pain in the liver.—The ash strengthens the teeth (Yunani).

The seeds are used as an external application in skin diseases. The expressed oil of the seeds is used in these diseases as well as in rheumatism.

A poultice of the leaves is applied to ulcers infested with worms.

The juice of the roots is used for cleaning foul ulcers and closing fistulous sores. It is administered internally with equal quantities of cocoanut milk and lime water every morning for the cure of gonorrhœa.

The fresh bark is used internally in bleeding piles.

A decoction of the leaves is used for medicated baths and fomentations in cases of rheumatic pains. The leaves are much resorted to as a domestic remedy in the treatment of diseases of children.

The oil is useful in cutaneous affections, and as a remedy in scabies, herpes, and other cutaneous diseases of a similar nature. It should be mixed with an equal quantity of lime or lemon juice and well shaken, when it forms a rich yellow liniment which has been used successfully in porrigo capitis, pityriasis, psoriasis.

In Ceylon, the juice of the roots is used for sores; also for cleaning the teeth and strengthening the gums.

The plant is recommended for the treatment of snake-bite and scorpion-sting (Charaka, Sushruta, Vaghbata, Brihannighantaratnakara, Nighantaratnakara, Yogaratnakara, Vrindamadhava).

In Ceylon, in cases of snake-bite the fresh seeds and roots are ground with water or with human urine and applied to the eyes; and a small quantity poured into the nostrils in stupor and coma (Roberts).

Every part of the plant is equally useless in the antidotal treatment of snake-bite. The roots and seeds are also useless as a collyrium and an errhine (Mhaskar and Caius). No part of the plant is an antodote to scorpion-venom (Caius and Mhaskar).

The oil from the seeds has been studied by Desai, Sudborough, and Watson (*Journ. Ind. Inst Sc.;* VI, 1923).

Patwardhan and Tumminkatti claim that " a bitter principle has

been isolated from the seeds of *Pongamia glabra* which has been found to be very effective against a number of skin diseases, *e.g.*, itches, scabies, boils, septic wounds, ringworms, and certain types of eczema" (18th Ind. Sc. Congress; Nagpur, 1931,—20th Ind. Sc. Congress; Patna, 1933).

Arabic: Aktemakat—; *Bengal:* Dahur karanja, Dalkaramcha, Darkaranja, Karanja, Karanjgachh, Karmuj, Khawari—; *Bombay:* Karanj, Kiramal—; *Burma:* Simizu, Thawen, Thengweng, Thinwin, Timizu—; *Canarese:* Batti, Honge, Huligili, Karanja—; *Central Provinces:* Kurunji—; *Ceylon:* Punku—; *Deccan:* Karanj—; *English:* Indian Beech—; *French:* Pongami—; *Gond:* Garanji—; *Gujerati:* Kanaji, Karanj, Karanjnu—; *Hindi:* Kanja, Karanj, Karanjaka, Kiramal, Papar—; *Indo China:* Day lim, Dok kom koi, Giay mau—; *Konkani:* Kerongi, Korongi—; *Kumaon:* Paper, Sukhchain—; *Malay:* Malapari—; *Malayalam:* Minnari, Punnu, Unnu—; *Marathi:* Ghanerakaranj, Karanj, Karanja—; *Mundari:* Kuronjodaru—; *New Caledonia:* Anabedi, N'Dori—; *Oudh:* Kanji, Papar—; *Persian:* Khaiulmalisa—; *Philippines:* Caddol—; *Portuguese:* Favas de chapa—; *Punjab:* Karanj, Paphri, Sukhchein—; *Rajputana:* Charr—; *Sanskrit:* Angaravalli, Badhaphala, Chirabilva, Dhana, Gaura, Ghritaparnaka, Guchhapushpaka, Hastija, Hastivaruni, Kaidarya, Kakaghni, Kalimara, Karabhandika, Karanja, Matry, Naktamala, Prakirya, Putika, Putikaranja, Putiparna, Putipatraka, Rochana, Shadagrantha, Shamgashta, Snigdhapatra, Tapasvi, Udakirya, Vishari, Vrittaparna—; *Santal:* Kuruinj—; *Saora:* Kamu—; *Sinhalese:* Magulkaranda—; *Tagalog:* Balicbalic, Balocbaloc, Baui, Bayocbayoc—; *Tamil:* Agirunanandam, Ilanji, Kanjanam, Kolliyam, Naguttam, Nanandam, Nattam, Nattamalam, Nirppungu, Ponga, Pungu, Tattaippungu, Udagu—; *Tayabas:* Balotbalot—; *Telugu:* Kagu, Kanuga, Kranuga, Krovi, Viaghranakamu—; *Tulu:* Korangi, Kurundi, Pungu—; *Urdu:* Karanjwah—; *Uriya:* Konja, Koronjo—; *Visayan:* Butong—.

Derris Lour.

Climbing shrubs (rarely erect trees). Leaves alternate, imparipinnate. Leaflets opposite, usually exstipellate. Flowers copious,

showy, in axillary or terminal racemes or panicles; pedicels usually fascicled along the rhachis; bracts small, caducous; bracteoles ovate or orbicular, usually small and caducous. Calyx in flower usually cyathiform, truncate or obscurely toothed. Corolla much exserted; standard broad; keel obtuse, its petals slightly cohering. Stamens usually monadelphous; anthers versatile. Ovary sessile; ovules few; style incurved, filiform; stigma capitate. Pod rigid, thin, flat, indehiscent, obliquely orbicular, oblong or elongate, distinctly winged down the upper or both sutures.—Species 50.—Tropics.

A. Pod thin, strap-shaped, narrow, winged along the upper suture .... 1. *D. scandens.*
B. Robust climbers. Leaves large. Stamens monadelphous
  1. Leaflets few. Standard not callose at the base .... 3. *D. uliginosa.*
  2. Leaflets many. Standard with 2 callosities at the base of the limb .... 2. *D. elliptica.*

The roots are insecticidal.

D. tamarindifolia Roxb. is used medicinally in Indo China, *D. elliptica* Benth. in the Malay Peninsula.

1. **Derris scandens** Benth. in Journ. Linn. Soc. IV (1860) Suppl. 103.—*Dalbergia scandens* Roxb. Corom. Pl. II, t. 192; Wight Ic. t. 275.

A very large climber often reaching 30 m. in length; stems smooth, dark-purple; young parts pubescent. Leaves 7.5-15 cm. long; rhachis deeply channelled, glabrous; stipules small, caducous. Leaflets opposite, 9-19, rigidly subcoriaceous, 3.8-5 by 2 cm. (the lowest pair the smallest), elliptic-oblong or obovate-oblong, subacute or very shortly acuminate, often slightly emarginate, glabrous and shining above, more or less pubescent beneath, reticulately veined, base rounded or subacute; petiolules 3 mm. long. Flowers numerous, in short-peduncled axillary racemes 25-45 cm. long, arranged in fascicles from the nodes of a puberulous rhachis, the flowers from the same node expanding at different times; pedicels filiform, 4-6 mm. long; bracteoles beneath the calyx 2, orbicular, 0.85 mm. long, ciliolate. Calyx 2.5-3 mm. long, thinly grey-silky; teeth obscure. Corolla 1 cm. long, white or pale pink; standard 6 mm. broad, the claw long; wings ciliate at the base above a long slender claw. Stamens monadelphous. Ovary pubescent. Pods 2.5-7.5 by 1-1.3

cm., tapering to both ends, pointed straight, narrowly winged on the upper suture, finely appressedly pubescent, somewhat turgid opposite the seeds. Seeds 1-4.

Distribution: Bengal, Central India, Chittagong, Burma, W. Peninsula, Ceylon.—S.-E. Asia to N. Australia.

In Ceylon, a decoction of the bark is given internally for snake-bite (Roberts).

The bark is not an antidote to snake-venom (Mhaskar and Caius).

Bengal: Noalata—; *Burma:* Meekyoungnway, Migyaungnwe—; *Canarese:* Handiballi—; *Ceylon:* Tekil—; *English:* Hog Creeper—; *Gond:* Golari, Nalavel, Potra—; *Hindi:* Gonj—; *Malay:* Tupail—; *Malayalam:* Muyalvalli, Nulalvalli—; *Punjab:* Gunj—; *Saora:* Mottasiralli—; *Sinhalese:* Kalawel—; *Tagalog:* Malasaga—; *Tamil:* Anaikkattu, Kodippungu, Punalikkodi, Puliyangodi, Tegil, Takil, Tirani—; *Telugu:* Cheratalibadu, Chiratalaboddutige, Chiratalabodi, Chirukatige, Mottasirli, Nalla-chiratalativva, Nallatige, Suruli—; *Uriya:* Kamocho, Mohaguno—.

2. **Derris elliptica** Benth. in Journ. Linn. Soc. IV. Suppl. 111;—*Pongamia elliptica* Wall. Pl. As. Rar. III, 20, t. 237. Wight Ic. t. 420.

Scrambling shrub. Stems black; shoots pubescent. Leaves 23-38 cm. long; leaflets 9 to 13, membranous, at length subcoriaceous, oblong to oblong-lanceolate cuspidate, 7.5-15 cm. long, 2.5-3.3 cm. wide, glabrous (adult) above, pubescent beneath. Racemes 23-25 cm. long, tomentose. Calyx 6.4 mm. long, campanulate, pubescent. Corolla rose-pink (rarely white), 16.5 mm. long; standard orbicular, back silky, base bicallose. Stamens monadelphous. Ovary villous. Pod oblong to lanceolate, 1 to 4- seeded winged on upper suture, slightly on lower 3.8-9 cm. long, 2 cm. wide.

Distribution: Martaban, Burma, Malay Peninsula, Siam, Malay Islands.

The roots are insecticidal, and used as a fish poison in Malaya.

The Malays use the bark as one of the ingredients in their ipoh arrow-poison.

Chinese: Yu T'eng—; *Malay:* Akor tuba, Tubah—.

3. **Derris uliginosa** Benth. in Pl. Jungh. (1851-55) 252.

A large climber; branches glabrous; bark dark-grey, covered with scattered lenticels. Leaves 12.5-20 cm. long; rhachis striate, glabrous. Leaflets 3-7 (usually 5), 5.7-10 by 3.2-5 cm. (the terminal the largest), subcoriaceous, ovate or ovate-oblong, acute or acuminate, sometimes slightly emarginate, glabrous on both surfaces, highly polished on the upper, minutely reticulately veined, base rounded or cordate; petiolules 3-6 mm. long. Flowers in axillary racemes 7.5-15 cm. long, the nodes of the rhachis produced into short stalks about 4 mm. long, each bearing 1 or more subequal slender pedicels 4 mm. long; bracts and bracteoles minute, ovate-oblong, subacute. Calyx 2.5 mm. long, glabrous or nearly so, with truncate or obscurely toothed ciliolate margin. Corolla 8 mm. long, rose-coloured; standard 13 mm. broad (broader than long), reniform, emarginate, without callosities at the base. Stamens monadelphous. Ovary pubescent. Pods 2.5-3.8 cm. long, variable in shape, sometimes orbicular, and as broad as long, or oblong and about ¾ as broad as long, thin, flat, reticulately veined, shortly apiculate, glabrous, narrowly winged on the upper suture, pale-yellow when ripe. Seed 1, reniform, compressed.

Distribution: Muddy seacoasts and creeks of the W. Peninsula, Ceylon.—China, N. Australia, Polynesia, Madagascar, Zambesi Land.

The bark is a fish poison. It is used in rheumatism and dysmenorrhœa.

Bengal: Panlata—; *Bombay:* Kirtana—; *Malay:* Akar ketuil—; *Sinhalese:* Kalawel—; *Tagalog:* Silasila—; *Telugu:* Nallatige, Tigekranuga—; *Visayan:* Hingasin, Hingasinan—.

SOPHORA Linn.

Trees or shrubs. Leaves odd-pinnate. Flowers showy, yellow or violet-purple, racemed or panicled. Calyx oblique, broadly campanulate; teeth deltoid, very short. Corolla much exserted; standard broad; petals equal in length, all with long claws; keel obtuse, with a small hooked mucro. Stamens free, or obscurely connate at the very base; anthers uniform, versatile. Ovary stalked, many-ovuled; style incurved, stigma capitate. Pod moniliform, sublignose or

membranous in our species, usually indehiscent, the joints turgid, terete.—Species 25.—Tropics and warm temperate regions.

A. Pod without wings or ridges. Leaflets 11-17 .... 1. *S. tomentosa.*
B. Pod with 4 wings or with 4 distinct raised lines or ridges
  1. Leaflets 20-30 .... 2. *S. mollis.*
  2. Leaflets 20-24 .... 3. *S. griffithii.*

The roots and herbage are considered antiseptic, subastringent, cathartic, and emetic.

The following are used medicinally in Malaya, Indo China, China, and Japan—*S. flavescens* Ait., *S. japonica* Linn.—; in Java —*S. tomentosa* Linn.—.

Cytisine is the typical alkaloid of the genus; but a distinct alkaloid, matrine, has been isolated from *S. flavescens* Ait.

S. tomentosa is used as a fish poison in Kenya.

1. **Sophora tomentosa** Linn. Sp. Pl. (1753) 373.—PLATE 342.

A small tree, the branches and whole plant covered with short, soft, grey velvety pubescence. Leaves large, shortly stalked, rhachis 10-18 cm., cylindrical, tumid at base. Leaflets 15-17 (7 or 8 pairs and end one) often alternate, shortly stalked, 2.5-3.8 cm., broadly oval obtuse and rounded at both ends, the margin somewhat reflexed, rather thick, the lower surface with more dense pubescence. Flowers rather large 2-2.5 cm.; pedicel as long as calyx, jointed near the top, rather closely arranged in stout, erect stalked racemes about 15 cm. long; bracts acicular, shorter than pedicels, deciduous; calyx somewhat inflated, densely velvety, segments very small, toothlike. Pod long-stalked, 5-15 cm., moniliform, the joints separated by narrow necks as long as themselves, sharply pointed, covered with velvety down. Seeds 1-8, 1 cm. diam., nearly globular, pale brown.

Distribution: On tropical shores throughout the world.

The seeds and roots are used in Ceylon and Java as a remedy for cholera. In New South Wales they are considered specific for bilious disorders.

The leaves are used as a purgative in New Caledonia. They are powerfully emetocathartic and toxic in large doses.

Burma: Thinbawmagyi—; *New Caledonia:* Digri—; *Philippine Islands:* Bangil, Baraumaran, Cabaicabai, Cauai, Guison, Manguyao, Mantala, Olaomag, Pangalangan, Rocnohan, Sandalaitan, Tambalaguisai, Tambalisa, Yabag—; *Sinhalese:* Mudumurunga—; *Swahili:* Mpingo—.

2. **Sophora mollis** Grah. in Wall. Cat.

An erect deciduous shrub 1.2-2.4 m. high, with stems up to 1.3 cm. diam. Bark quite smooth, green. Shoots finely grey-pubescent or downy. Leaves imparipinnate, 12.5-25 cm. long. Leaflets 21-45, opposite or alternate, 1.3-2.5 cm. long, ovate or oblong, obtuse, entire, more or less sparsely downy on both surfaces. Petiolule 1.3 mm. long. Flowers bright yellow, 2-2.5 cm. long, scented, appearing shortly before the leaves, in axillary racemes 5-10 cm. long, Pedicels 7.5-10 mm. long. Pod 7.5-12.5 cm. long; joints 5-10, 1-seeded, more or less distinctly constricted between the seeds, 4-winged, glabrous when mature.

Distribution: Plains and low hills of the North-West, Hazara and the Salt Range to Kumaon and Nepal, up to 4,000 ft.

The burnt root is styptic; cures diseases of the liver and kidney; promotes the growth of hair and gives it a dark colour.—The flower is sweetish; useful in troubles of the kidney, lumbago, gleet, urinary discharges; the decoction is emetic.—The seeds are good in diseases of the eye (Yunani).

The seeds are considered useful to destroy vermin.

Afghanistan: Arghawan—; *Arabic:* Arghavan—; *English:* Himalayan Laburnum—; *Garhwal:* Sakina—; *Persian:* Arghavan—; *Punjab:* Bankeinti, Brisari, Buna, Kathi, Kohen, Kun, Malan, Tarni, Tilun—; *Urdu:* Arghavan—.

3. **Sophora griffithii** Stocks in Hook. Kew Journ. Bot. IV (1852) 147.

A shrub; branches shortly white-tomentose. Leaves 10-20-jugate; leaflets on both sides appressedly silky-silvery, ovate or obovate. Racemes few-flowered. Calyx densely tomentose with triangular obtuse teeth. Petals subequal, glabrous. Legume when

young appressedly white-tomentose, articulations oblong, at both ends attenuate.

Distribution: Baluchistan—Afghanistan.

At Sethari, in Wad, Kalat, the juice is put into sore eyes. At Mahri in Jhalawan, a decoction of the roots is applied warm to the head to remove headache. In the Harboi Hills, the seed is used powdered and mixed with oil to kill lice in the hair (Hughes-Buller).

Gandava Pass: Shampustir—; *Harboi Hills:* Shampastir—; *Jhalawan:* Shampashtir—; *Kalat:* Shampastir—; *Kila Saifulla:* Zagherah—; *Kohlu:* Ghazira—; *Shahrig:* Ghozera—; *Wad:* Shampastir—; *Zhob:* Ghozera—.
